APRIL, 1951
Vol. 7---No. 2

Lubrication ENGINEERING

CONVENTION ISSUE

ANNUAL ASLE CONVENTION AND EXHIBIT
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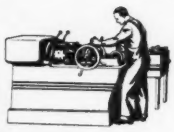
TIPS ON TAPPING AND THREADING TROUBLES



DATA

- OILS FOR TAPPING AND THREADING

Oils With Active Sulphur Required

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Lubrication ENGINEERING

VOL. 7 APRIL, 1951 No. 2

In This Issue

Lube Lines ... 57
Gear Oil Additives — A. F. Brewer and P. J. Keating (Fundamentals of Lubrication No. 3) ... 58
Abstracts — 1951 Convention Papers ... 65
Lubrication, Its Importance to Plant Fire Safety — R. G. Shepherd ... 68
Lubrication Panel ... 70
Authors — 1951 Convention Papers ... 72
National Program Committee — ASLE ... 73
1951 Convention Program — ASLE ... 74
ASLE Lubrication Show, Listing of Exhibitors ... 81
News of the Sections ... 82
New Products and Equipment ... 87
Section Officers ... 94
Current Literature ... 95
Patent Abstracts, Oils and Lubricants ... 100
Advertisers' Index ... 104

Special Features:

Philadelphia Invites You 78
Convention Functions ... 91
Personals ... 93

LUBRICATION ENGINEERING
Official Publication of the American Society of Lubrication Engineers
343 S. Dearborn Street, Chicago 4, Ill.

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Subscription — $4.00 annually. Single copies — $.75. Published bi-monthly.

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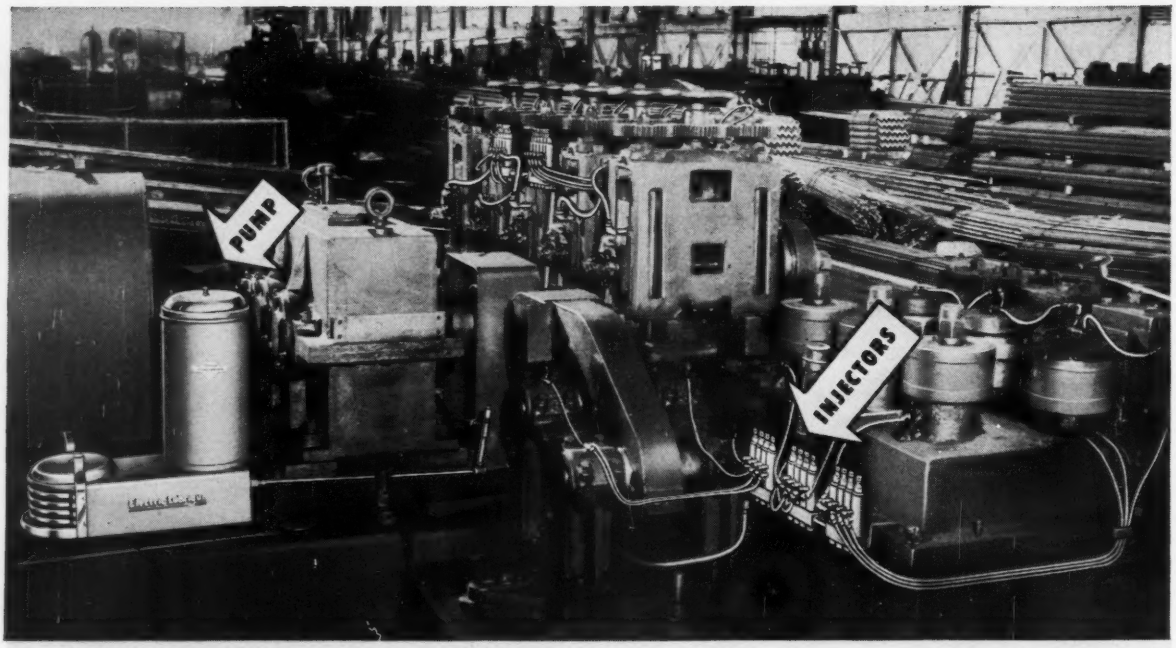
Printed in Cincinnati, Ohio, by S. Rosenthal & Co., Inc.

The A.S.L.E. will not be responsible for statements or opinions advanced in its meetings or printed in its publications.

Advertising and Editorial Offices CHICAGO: 343 S. Dearborn St., Chicago 4, Ill., Webster 9-3848.



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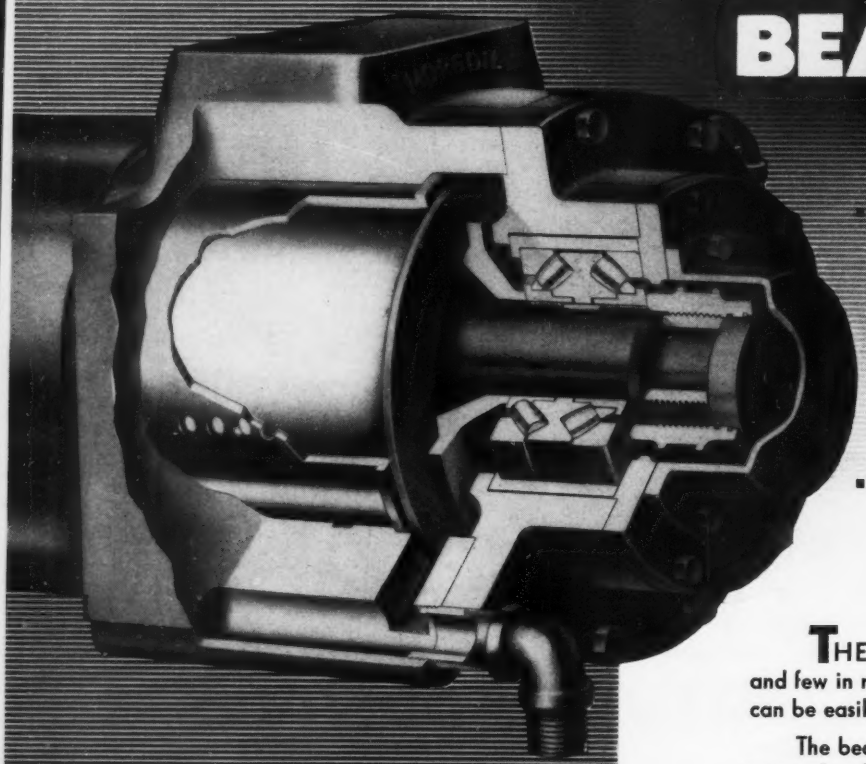

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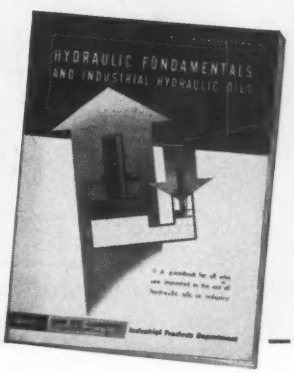

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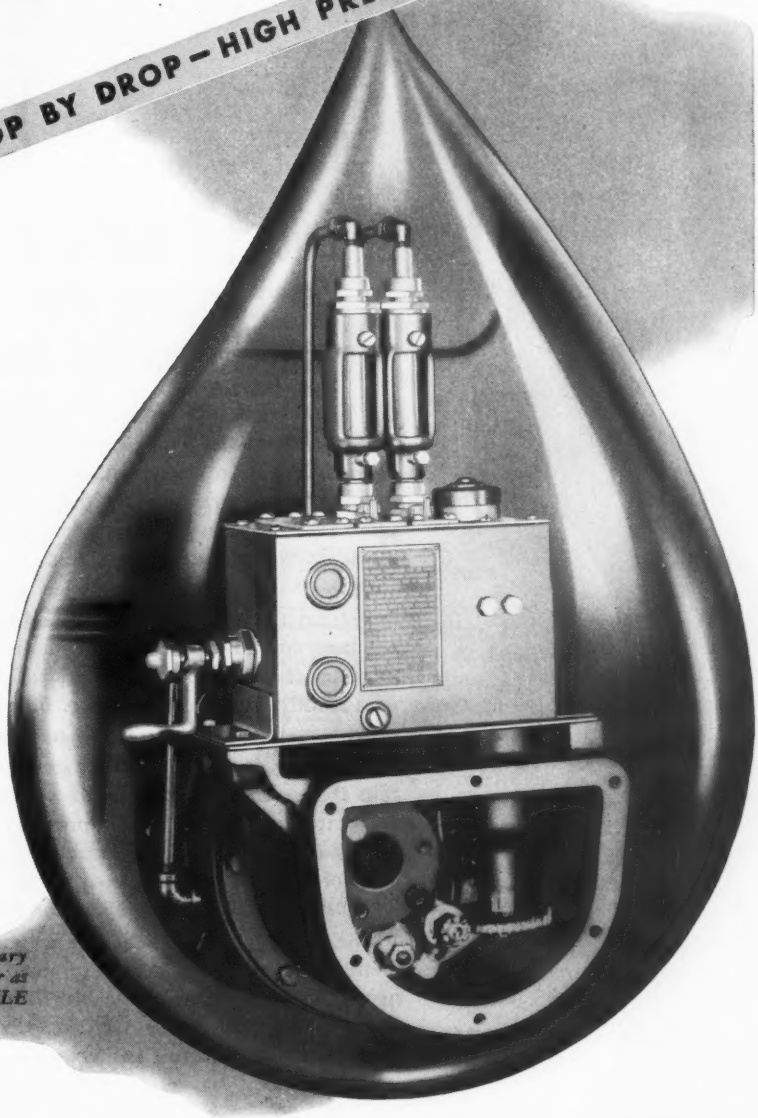

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Lube Lines

Lubrication International

We have a bit proudly, although in a casual manner, discoursed now and then on the scope of ASLE and its Journal, LUBRICATION ENGINEERING.

The gradual increase in mail arriving from outside the United States prompted us to make a complete survey on an international basis. We report our findings, which we consider startling, in view of the comparative youth of the Society.

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Space does not permit listing of cities in the countries named.

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Mutual interest in the subject of lubrication has indeed welded us into an international organization.

Equipment Lubrication Course

The Zia Company, Los Alamos, New Mexico, is a contractor of the Atomic Energy Commission, and one of its functions is to perform the maintenance and repair work at this installation. The variety of equipment required to operate under unusual conditions and a rapid advance in the lubrication field, plus the factor of costs, prompted the inauguration of a training program. The efforts of management to make this course available, and the interest of the mechanics participating, assured the success of the program.

Twelve men of the Tech Area Stationary Equipment Section took part in the 24-hour course, which was conducted by W. D. Thornton, Supervisor of the Stationary Equipment Section, and a member of the ASLE. Lectures and discussions were given on the following subjects: Properties of Oil, Lubrication Fundamentals, Improved Methods of Lubrication, Standardization of Lubricants, Determining Types and Grades of Lubricants, Bearings, Operation and Maintenance of Diesel Engines, Lubrication Costs, etc. Guest speakers included S. A. Musser, Chief Tech Area Division, F. C. Humphreys, Combustion Engineer; R. L. Rominger, Wynn Oil Company, and J. N. Shuffler, The Texas Company. Training films were included, and each member of the group was furnished a rather extensive collection of instructions, information and research data on lubricants. Upon completion of the course, certificates were issued to the twelve men participating.

We are indebted to Mr. Thornton for sending on this information, which should stimulate similar activities throughout industry. This course is indicative of the need for, and results of, this necessary assistance to men in the lubrication field.

Lubrication Engineers

Your editor's attention has been called to an omission from the recently published list of universities offering courses in Lubrication Engineering (See Lube Lines, LUBRICATION ENGINEERING, December 1950).

The University of Oklahoma offers one or more courses in this field every semester. The current semester includes two courses—Fuels and Lubrication—and a seminar in advanced problems in fuels and lubricants under "Problems in Mechanical Engineering." In addition, Oklahoma U. has had one graduate student receive his Master's degree, with a thesis based on studies in this field.

We are pleased, through the good offices of Walter J. Ewbank, of the University of Oklahoma, to bring to the attention of our readers, this addition to the list of higher educational institutions, where facilities are available for advanced studies in lubrication.

Bulletin from M.I.T.

Plans for the M.I.T. Summer Course in Lubrication Engineering to be held June 11-22 which was announced in the February issue of this Journal are taking final shape. Considerable interest has already been expressed in the course and it is suggested that those wishing to enroll make their application without delay as the size of the class will be definitely limited.

As announced previously, requests for further information and letters of application should be sent to Professor Walter H. Gale, Director of the Summer Session, Room 3-107, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

NUMBER 3

GEAR OIL ADDITIVES

*by A. F. Brewer**
and
P. J. Keating

Technical and Research Division
The Texas Company
New York

A. F. BREWER

P. J. KEATING

Mr. Brewer graduated from the Massachusetts Institute of Technology. In World War I he served as a commissioned officer after attending the Navol Reserve School at Stevens Institute of Technology.

He has been connected with the petroleum industry since 1919, joining the Texas Co. after his release from Naval Service. Until 1922 his capacity was Lubrication Engineer in the Port Arthur, Texas, refinery. Later he was transferred to the New York office where he is at present attached to the technical and research division, and is editor of the magazine LUBRICATION, published by the Texas Co.

Mr. Brewer is a member of ASME, AISE, ASRE (being their representative on ASA Committee Z 11) and ASLE. In the latter Society he has been active in committee work in the New York Section, as well as in the National Society.

Mr. Keating graduated from Rice Institute in 1931 with a B. S. degree in Chemical Engineering. He joined the Texas Co. in 1931 at its Asphalt Refinery in Port Neches, and for seven years was concerned with refinery problems and development work on asphalt and roofing products.

In 1938 he was transferred to the T & R Div. of the Texas Co., New York, where he has been associated with technical service and research activities. As Assistant to the Director of Research, he has devoted most of his activities to asphaltic products, cutting fluids, gear oils and greases.

Mr. Keating is a member of the AIChE, ACS and AAPT and Phi Lambda Upsilon. He has three patent applications pending.

The extensive use of additives in gear oils is not new. Actually it began about 1930 and paralleled the commercialization of the hypoid type gear. Long before this, however, fatty materials of natural origin were used. In the early days of the machine age they functioned as the sole lubricant for crude gears. Today, such materials are an important class of gear oil additives.

Gearing — probably one of the oldest mechanisms for transmission of power, is also in its modern form probably one of the most controversial with regard to lubrication. The capacity of metallic gears was made use of by machine designers when the petroleum industry had developed sufficiently to furnish dependable lubricants which would effectually protect gear tooth surfaces from wearing too rapidly. Even from the days of the crude wooden toothed gears, it was known that some form of greasy lubricant would prevent noise. Wear was not too serious a factor in those days as speeds were low and gear tooth loads were not excessive; animal fats served the purpose just as they also served to lubricate the bearings of contemporary machinery.

The first petroleum gear lubricants were simply the residual products derived from refining straight mineral oils. They were widely referred to as compounds for many years even though many types were straight petroleum or mineral oil products. It was a loose application of the word compound for in petroleum parlance compound means a combination of a fixed or fatty oil with a petroleum oil. For the typical spur gear as employed on slow speed cement, steel mill and rubber machinery where rotational speeds do not exceed 100 R.P.M., these heavy bodied straight mineral oils sufficed. More fluid straight mineral oils of turbine grade in turn were better suited to high speed single helical and herringbone reduction gearing where pinion speeds may approach several thousand R.P.M. Textile machinery and machine tools were among the first to adopt these drives.

When automotive engineers designed a truly workable motor vehicle early in the century, gear design really began to progress. The spur gear and straight bevel gear were quite suitable to most of the other types of machines of that period, but the marine steam turbine and motor car required a type of gear which would run quietly at high speeds. The helical, herringbone and spiral bevel ideas served this purpose, the latter paving

* Eastern Regional Vice President A.S.L.E.

the way to subsequent development of the hypoid gear.

At one stage in the early development of gear lubricants the thought prevailed that by thickening a medium viscosity petroleum oil with a material which might or might not have much lubricating value, the latter would take up the shock loads on the gear teeth somewhat like a cushion. Too often these were of doubtful lubricating value since some of them had little ability to re-establish a lubricating film on the tooth surfaces between successive engagements of the teeth. Such a product may stay on the teeth when first applied, but after the teeth have meshed a few times it will either be forced to the base of the space between the teeth where it will probably remain packed, or the action of centrifugal force will cause it to be thrown off.

When this occurs insufficient lubricant usually will remain on the gear tooth surfaces, consequently, boundary lubrication may develop and where pressures are sufficiently high tooth wear will result. The appearance of the teeth can be deceptive, for even though they may seem to have an oily surface, the film strength is not sufficient to prevent wear. The explanation is that as the teeth become disengaged, the tips, which have been forced down into such a lubricant when meshing tend to wipe over adjacent tooth surfaces and leave an oily appearance although metal abrasion already has occurred.

LUBRICANT FILM-STRENGTH

The necessity for adequate film strength in a gear lubricant became apparent when speeds and tooth loads were increased and subsequently the protective ability of Extreme Pressure lubricants was demonstrated on hypoid gear tooth surfaces. Gear teeth, regardless of their design or the accuracy with which they are made, develop a combination of sliding and rolling motion as they pass into and out of mesh. Since sliding always prevails between gear teeth, accompanied so often by very high pressures which are comparable to those encountered in rolling contact bearings, maintenance of the lubricating film is a most important requirement.

In order to understand where film-strength fitted into the program of developing the modern gear lubricants the types of lubrication which can exist must be discussed. They involve:

1. Thick-film or hydrodynamic lubrication
2. Boundary lubrication.

Thick-Film Lubrication

In thick-film lubrication the parts are completely separated by a film of oil so when one tooth surface slides over another the oil film will be sheared continuously as in Figure 1.

The term "film-strength" as applied to thick-film lubrication, therefore, has no significance. The oil film cannot be considered in terms of some material having resistance to puncture or which has tensile strength. It is a fluid material which supports the load entirely by hydraulic action, and the oil characteristic which controls this action is viscosity. As a result, the presence of film strength additives of phosphorus, chlorine, or sulfur compounds in the oil can serve little useful purpose during thick-film lubrication.

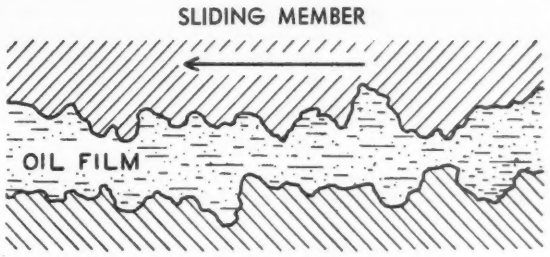

Fig. 1
With thick-film lubrication the moving parts are completely separated by an oil film. The roughness of the surfaces are greatly exaggerated for purposes of illustration.

If the viscosity is increased, the oil film becomes thicker and more work is required to turn the gears in and out of mesh. In other words, the friction is increased. However, if the oil viscosity is decreased, the film becomes thinner and although the work required then is less, the high spots on the tooth surfaces approach nearer to each other and the transition from thick-film to boundary lubrication is approached. Similarly, if the load is increased or the speed is decreased, the tooth surfaces approach each other and again the action approaches boundary lubrication.

Boundary Lubrication

When conditions of load, speed and oil viscosity are such that the oil film is too thin to separate the gear teeth completely, then the high spots may begin to touch each other as in Figure 2. Thick-film lubrication no longer exists and the condition termed boundary lubrication is approached. As the load is increased or the speed is decreased, more and more of the high spots tend to come in contact and the force required to turn the gears increases. What actually happens at the high spots and also what happens to the contacting surfaces involves both chemical and physical phenomena. The theory is that Extreme Pressure additives support the load by forming a chemical film or by forming an easily sheared film such as lead sulfide, lead chloride, etc.

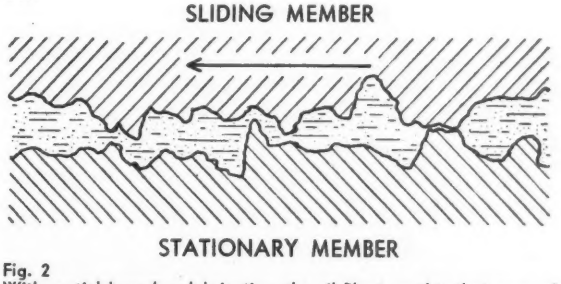

Fig. 2
With partial boundary lubrication, the oil film is so thin that some of the high spots of the sliding member touch the high spots of the stationary member.

Research has shown that certain materials termed oiliness or polar agents are effective in reducing friction under boundary lubrication conditions. These materials are high molecular weight organic compounds containing carbon, hydrogen and oxygen as compared to lubri-

cating oils which contain only carbon and hydrogen. When one end of the lubricant molecular is highly reactive, it has the property of forming a powerful bond with a steel surface or may actually form soaps and enhance load carrying capacity.

WHY AND HOW GEARS FAIL

When a gear tooth fails it may involve actual breakage of one or more of the teeth, or there may be failure of the tooth surfaces. Tooth breakage is rarely attributable to faulty lubrication. Poor metal structure, faulty design, abuse or excessive overloading are more usually the cause. Lubricants which would otherwise be amply protective cannot insure against failure under such conditions, nor can they always keep the temperatures within reasonable limits. Abnormal temperatures from any source can cause imperfect surface lubrication with resulting excessive friction. Then scoring and/or scuffing may develop, along with perhaps softening and cracking. Under such conditions, the temperature over the contact areas of the teeth has probably become high enough to reduce the viscosity of the oil film to such an extent that the lubricating value of the film on the teeth is negligible. If this continues, more friction, more heat, less lubrication and more tooth failures will result.

On exposed gears, the lubricant must be adhesive as well as viscous — otherwise the film cannot resist the action of centrifugal force. There is no continuous replenishment of lubricant on the surface by dip or spray as is possible with enclosed gears.

Where dealing with bath or dip lubricated gears, the lubricant is chosen so that at the operating temperature the viscosity will be sufficient to train with the teeth. If the oil is too light an insufficient amount may be carried by the dipping gear to the companion gear or worm. In this case, the cooling ability of the lubricant will be lost. Under such conditions, a worm gear for example, may run so hot as to cause the threads to soften and crack, or to result in wiping of the bronze teeth of the worm wheel. For this reason, some designers improve the adhesiveness of a worm gear oil by using a compounded product containing a polar agent. Other authorities feel that a lubricant containing lead naphthenate (which has mild E.P. properties) and which is non-corrosive to copper, bronze or steel, provides reduction in friction load, lower temperature at the interface surface and increased efficiency. In a worm gear, the rate of sliding is greater than in a spur, bevel or helical gear.

Wear

When the tooth surface of a gear becomes impaired, it may progress through several recognized stages. First, more or less abrasion or rubbing off of the metallic surfaces occurs. Spur, helical or bevel gears will often become smooth and highly polished during the initial stages of abrasive wear. To some extent this could be regarded as a "wearing-in" procedure. It is regarded as being related to the viscosity of the gear oil, as it is apt to occur more rapidly with lower viscosity lubricants. A heavier oil or one with E.P. characteristics will present a more durable film on the teeth and retard this type of wear. High tooth loads and low speeds also contribute to excessive wear if the viscosity of the oil is not chosen accordingly. Evidence of wear is most pronounced below the pitch line of the pinion if lubrication has been ineffectual. While abrasive wear is progressing the theory is that the fine metallic particles which are worn off the teeth, mix intimately with the oil film to develop a lapping action. The best "wearing in" or "running in" action is that which results in polished low friction surfaces with minimum of metal removal from the gear tooth surfaces. All this is accomplished by the proper selection of viscosity and additive combination in a suitable base oil.

Scoring and Galling

These often follow abrasive wear due to actual metal-to-metal contact. Here wear is more severe and tearing of the tooth surfaces is evidenced. Normally this occurs in the direction of sliding. Scoring develops regardless of the hardness of the tooth surfaces, but it often may show more of a tearing nature and develop into galling with softer surfaces where total absence of any oil film has permitted welding to occur between the high spots of the tooth surfaces.

Welding

The theory back of this welding action, which, incidentally, led to the development of Extreme Pressure gear oils is of interest.

In the case of steel on steel, the lubricant present, even the adsorbed polar molecules, cannot always prevent minute high spots from deforming and breaking off to form fresh surfaces of clean metal. When two freshly formed surfaces slide over each other the local temperature at these spots becomes very high because a considerable amount of heat must be dissipated over a very small area. As a result, welding takes place, and the rupture of the metal to form more fresh surfaces occurs.

So long as the high spots on the teeth are at all times separated by several molecular layers of oil there can be no wear. If, however, the mechanical attack at the contact areas by metals rubbing together becomes severe enough to remove the ultimate protecting film, the rubbing clean metals will seize, possibly causing irreparable damage to the surfaces. This seizure, which is welding on a small scale, can become progressive to result in the gross removal of metal, i.e., tearing and quick and complete failure.

If conditions are right, more and more metal is torn off. By this time most of the prominent high spots have been removed and instead of welding of the small peaks of a few high spots, larger areas weld. This is aggravated as the speed and load is increased. Research has demonstrated that with the higher loads the maximum localized temperature is reached at a lower speed, and conversely at a high speed, the load required to reach maximum high spot temperature is lower than at slow speeds.

In other words, the volume or thickness of the oil film under the prevailing pressure and sliding velocity determines whether or not an E.P. lubricant is necessary. When the oil film is too thin to prevent metal-to-metal contact, the use of an Extreme Pressure oil should be seriously considered. Beyond boundary lubrication, it is essential to counteract with additives the shock or intermittent loads as well as the continuous loads which develop at any speeds.

One of the most difficult problems of lubrication which has developed in recent years, for example, is in connection with hypoid gears. Intensity of load and speed of rubbing are such that a special lubricant is required. Wherever high power losses and wear prevail there is a problem. Under high loading the oil film between the high spots becomes extremely thin. So long as it exists at all there can be no clean metal contact, and therefore no abrasion, but this condition can only continue so long as the rate of removal of the film does not exceed its rate of renewal.

This explains why lubricants that are satisfactory for spiral bevel gears may not have sufficient Extreme Pressure characteristics for hypoids. The sliding action is more severe in hypoid gears, so consequently, for the same load, the contacting high spots of hypoid gears are more likely to reach welding temperatures. Industrial gearing need not be of the hypoid type to require an E.P. lubricant; loading is a factor.

In industry, where gearing is adequately proportioned in line with American Gear Manufacturers' Association practice, and housed, comparatively fluid lubricants are generally applicable. They are applied to the gear teeth and bearings either by force feed lubrication or splash in contrast to automotive service where bath lubrication prevails.

Pitting

Pitting involves the formation of small pits in the tooth surfaces, usually starting in the vicinity of the pitch line, and frequently occurring during the initial period of gear operation.

Pitting is related to surface cracking; it is a fatigue failure. It involves actual removal of surface material to a depth dependent upon the localization of stress. While it occurs very often at low speeds and at low operating temperatures where high torque prevails it is not restricted to low speed.

Where constant repetitive shock loading or hammer action is induced by some action in the machine, a condition akin to fretting corrosion * occurs which can cause the teeth to pit.

WORM GEARS

Worm reduction gears are applicable where motion is to be transmitted between two non-intersecting shafts, located in different planes at right angles to each other. The worm, which is usually the driving element, is a cylinder, on the surface of which is cut one or more continuous helical teeth, which more or less extend round and round over the entire length. Its companion mechanism is a helical type gear usually made of phosphor bronze. Worm gears are well suited to conditions requiring a comparatively high reduction ratio with a minimum of gears.

Factors Governing Lubrication

For lubrication to be effective an ample film of lubricant must be kept on the worm and gear teeth to prevent wear, to reduce the starting and operating torque as far as possible and to lubricate the shaft bearings with a minimum of frictional resistance. Ball and roller bearings are extensively used in such installations, especially for the worm shaft, and for the purpose of taking up end-thrust. In theory, anti-friction bearings should be served with as low a viscosity lubricant as will provide effective lubrication, protect the highly polished surfaces and serve as a coolant. A compromise may often be necessary, especially when the one lubricant must be used throughout the gear set and protection of the bearings is as important as protection of the gears.

SELECTING GEAR LUBRICANTS

During the transition in gear design, gears, of course, had to be lubricated, even though there was no scientific procedure for ascertaining the most suitable viscosity for any or all cases. Practical experience over the years resulted in the development of a considerable variety of gear lubricants to meet the requirements stated above. Today they vary all the way from straight mineral oils to intricate mixtures. Any finely divided solid material which serves only as a thickener and has little or no lubricating value is not recommended for modern gearing. It may very well be deceiving in that an uninformed user may believe that his lubricant is suitable, when, in reality, it is giving comparatively poor protection against wear. The necessary adhesive characteristics also may be relatively low. As a result, when used under high-speed conditions, or wherever the gears may come into contact with water, acids, alkalis, or chemical fumes, the gear teeth may lose their protective film of lubricant, due either to its being thrown off by centrifugal force, or washed from the wearing surfaces.

Worm Gear Oils

Modern design dictates that a worm gear lubricant must have certain definite properties in order to function effectively, i.e.:

1. The lubricating ability or "oiliness" must be adequate to insure the reduction of both solid and fluid friction to a minimum.
2. The viscosity or body must be suited to the method of lubrication and the amount of heat that may be encountered so that a suitable film will be insured between the teeth to withstand the effects of both pressure and temperature. Pressure exerts a squeezing out action; elevating the temperature causes a lubricant to become more fluid, according to its degree, for viscosity is reduced as temperature rises.

Pressure is of distinct importance in the study of worm gear lubrication. Tooth pressures normally will be high and the bearing surfaces, due to their relatively small areas of contact, will carry heavy loads.

Inasmuch as contact between a new worm and gear set is not as perfect at the start as it becomes after the worm has seated itself in the gear, the unit pressure between any two such elements will normally be greatest during the "wear-in" period. Unit pressure becomes minimum and constant after seating is completed. It will require some time for the wearing-in process of a worm and gear to become complete, depending upon the ratio and imposed load.

* See "Fretting corrosion" article in *Lubrication*, March, 1948.

When excessive wear occurs particles of bronze are worn from the gear and may adhere to the worm, in the zone of contact. The resultant comparatively rough surface will tend to score the gear and cause continuation of wear. If this can be caught in time further wear can be prevented by removing the worm and cleaning all traces of bronze from the worm threads.

Under conditions of this sort the non-corrosive type of lead soap gear oil should give protection against further excessive wear.

Application

Where the gear set is designed so that the same lubricant serves both gears and bearings the lubricant must be sufficiently fluid to follow the bearing clearances and yet viscous and adhesive enough to maintain a satisfactory film on the gear teeth.

The use of anti-friction bearings frequently presents another problem, wherever they are contained within the case, for their protection is as important as the lubrication of the gear teeth and the reduction of starting and running torques.

This has developed another point for discussion when non-corrosive lead soap lubricants are considered. Evidence accumulated in actual service has proved that the mild, E.P. non-corrosive lead soap gear lubricant has a definite place in worm gear lubrication whenever severe duty prevails. It is also valuable in protecting the worm and gear tooth surfaces from wear, corrosion and rusting under heavy duty conditions and has no detrimental effect on the anti-friction bearings if kept clean so there is no sludge and consequent abrasive wear of bearing. The oil film is unusually persistent, resisting displacement by the shearing action of the sliding teeth. The resultant decrease in frictional heat gives added protection from fatigue pitting of the bronze and steel tooth surfaces. Also unusual protection from rusting of gears, gear case and bearings is afforded since the oil film resists displacement by water to a remarkable degree.

APPLICATION AND FUNCTION OF ADDITIVES*

A gear oil additive may be defined as a chemical compound which either imparts new properties to the mixture or else enhances the properties which the oil already has.

The design of gear lubricants is not a simple problem but research conducted during the past two decades has provided a rather large amount of fundamental information which is very useful for meeting present day gear lubrication problems. However, it must be appreciated that many of the theories concerning the role of gear oil additives are not universally accepted and the skill and experience of the oil technologist is of considerable importance in this problem.

In the formulation of gear lubricants the additives used generally fall into fairly well defined groups depending on the type of gear and the conditions of operation involved. Table I shows this graphically though in a very simplified form.

General

The choice of Pour Depressants, Viscosity Index Improvers and Foam Depressants presents no particular problem because the types employed are also used in lubricating oils of all types. A particular selection may be influenced by the effectiveness of the additive as well as its cost.

Specific Gear Oil Additives

Selection of Extreme Pressure and polar additives is by far the most important phase of formulating gear oils and since so many materials are available for consideration it is important to relate the function of additives to general chemical types and avoid "trial and error" research as much as possible.

Type 1. It is, of course, a well-known fact that straight mineral oils have given and continue to give satisfactory service on many types of gears under normal operating conditions — light load and low or high speed. Further comment on this type of gear lubricant is unnecessary.

Type 2. In the past and even today, a gear lubricant containing a sulfurized fat such as lard oil is specified for spur, bevel or spiral bevel gears for "run-in" or "break-in" purposes. After the initial fill a straight mineral oil is specified for normal operating conditions.

With sulfurized fats, it is intended that sulfur be available to prevent welding by forming iron sulfide at the metal to metal peak contacts shown in Figure 1. The sulfur must be sufficiently stable to prevent staining of copper and brass, hence the "non-corrosive" designation.

Type 3. A somewhat more complex formulation involves the use of lead, sulfur and phosphorus and is an application of a modern theory of the function of extreme pressure agents. This class of gear lubricant is intended for many types of gears operating under conditions of high load and/or speed. The additives must be chosen to be active chemically under these conditions. Welding at high temperature is prevented by the formation of an easily sheared film of iron and lead sulfide and also by the formation of a low melting point phosphorus alloy. In this manner, welding is prevented over a range of operating conditions. Oftentimes, the mere prevention of welding is not sufficient for satisfactory lubrication and a polar compound must be used to reduce friction and afford acceptable operating temperatures.

Type 4. The adoption of the hypoid gear by the automotive industry for high speed/low torque condition required a gear lubricant that would prevent welding under conditions differing radically from those encountered before. In this type of gear the tooth pressure is high, coupled with a pronounced wiping effect. Thus it is easy to visualize that the proper lubrication of the hypoid gear in high speed/low torque conditions must be accomplished under new conditions of temperature and pressure. To do this it has been found necessary to choose additives to prevent welding but—and this is the important point representing devel-

* Definition of "additive"—while unquestionably the ingredients are chemical compounds, many commercial additives are mixtures, and sometimes the exact chemical structure of the active ingredients is uncertain.

opment and application of a new theory—the *temperature* and *rate* of formation of the easily sheared film must be regulated and controlled. This can be done by using a lead soap and *active* sulfur. This class of gear lubricant causes high wear under high torque — low speed conditions. The active sulfur is the key to this type of formulation. The sulfur is bound in a rather loose chemical manner and controlled to be available at the required temperature and in the proper amount. It should be obvious that sulfur when present at this high level of activity would stain copper — hence the designation — corrosive type. This type of lubricant is particularly effective when shock type loading is a factor.

TABLE 1

GEAR OIL ADDITIVES

TYPE OF ADDITIVE	FUNCTION IN LUBRICANT
POUR DEPRESSANT High Mol. Wt. Polymer or Wax Naphthalene Condensation Product	Reduce the Pour Point or Channel Point of the lubricant so that it will flow freely at reduced temperatures.
VISCOSITY INDEX IMPROVER High Mol. Wt. Resin	Improve the Viscosity—Temperature relationship of the lubricant to minimize viscosity spread over service temperature range.
FOAM DEPRESSANT High Mol. Wt. Silicone Polymers	Prevent foam or accelerate foam collapse.

EXTREME PRESSURE AND POLAR AGENTS

	Function	Type of Gear	Normal Operation	Heavy Duty Extreme Pressure Lub. Required
Type 1 No additive	General Lubrication	Spur Bevel Spiral Bevel Annular or Internal Helical or Herringbone Worm Rack and Pinion	yes yes yes yes yes yes yes	
Type 2 Non-Corrosive Type Sulfurized fat	Prevent welding by: forming an easily sheared film: iron sulfide	Spur Bevel Spiral Bevel	yes yes yes (and break in)	
Type 3 Non-Corrosive Type Lead Soap Sulfur Phosphorus Polar Agent (optional)	Prevent welding by: (a) forming an easily sheared film: iron sulfide, lead sulfide, etc. (b) forming a low melting point phosphorus alloy. Reduce friction: Metal to metal contact or between easily sheared films.	Spur Bevel Spiral Bevel Annular or Internal Helical or Herringbone Worm Rack and Pinion		yes yes yes yes yes yes yes
Type 4 Corrosive Type Lead Soap Active Sulfur	Prevent welding by: forming an easily sheared film; iron sulfide, lead sulfide, etc.	Hypoid	yes High speed— low torque with shock loading.	
Type 5 Non-Corrosive Type Chlorine Sulfur Phosphorus	Prevent welding by: (a) forming an easily sheared film: iron chloride. This action is catalyzed or speeded up by the presence of sulfur and its compounds. (b) forming a low melting point phosphorus alloy.	Hypoid	yes High speed— low torque	yes Low speed— high torque
Type 6 Non-Corrosive Type Lead Soap Sulfur Chlorine Polar Compound (optional)	Prevent welding by: forming an easily sheared film: iron sulfide and iron chloride. The formation of iron chloride is catalyzed by the presence of sulfur and its compounds. Reduce friction: Metal to metal contact or between easily sheared films.	Hypoid	yes High speed— low torque	yes Low speed— high torque

Type 5. With the widespread application of the hypoid gear for high speed/low torque and low speed/high torque conditions — it was necessary to modify the lubricant described in (4) to accommodate the more severe conditions of tooth pressure, wiping action and temperature and to prevent wear. Again a more specialized application of the theory that the *temperature* and *rate* of formation of the easily sheared film for a particular range of operating conditions was required.

This type of gear lubricant is actually the "all-purpose" or "multi-purpose" type as covered by Military Specification MIL-L-2105, 7 April 1950 — Universal Gear Lubricant. This specification was developed as the result of cooperative effort with the automotive manufacturers and the oil industry.

In the formulation of lubricants for this service, additives containing chlorine, sulfur and phosphorus are employed. The essential variation from (4) is that the formation of iron chloride which prevents welding is catalyzed or speeded up by sulfur to insure satisfactory service under very severe operating conditions. The role of phosphorus is similar to that previously described.

Type 6. This type of gear lubricant is similar to that in (5) since the lubrication of hypoid gears is the primary purpose. From an additive standpoint the principal change is the inclusion of a lead soap and the omission of phosphorus. This type of lubricant can be made to meet 2-105B and there is evidence that it will handle more severe operating conditions than the conventional Universal Gear Lubricant. This difference can be shown in controlled road testing procedures. It has been found that a lubricant which will give satisfactory service in a severe road test involving a 1½-ton tractor-trailer unit (24,000 pounds gross) operated at 19 MPH average over mountainous terrain for 3000 plus miles will not necessarily pass 2-105B requirements. This statement is not made from the standpoint of criticism. Instead it is believed to support the theory that gear lubricant additives must be chosen on the basis of chemical activity and this property must be fitted to predetermined operating conditions.

CONCLUSION

From the foregoing simplified description of how various types of gear lubricants are designed for specific application it should be apparent that the successful lubrication of all types of gears is the result of

(a) significant progress in understanding the function of extreme pressure additives,

(b) ability to select additives to perform satisfactorily at different severity levels of operation, and

(c) proper appreciation of the importance of selecting the proper gear lubricant.

Admittedly, knowledge of gear lubricant additives is not as complete as desired and considerable fundamental research remains to be done if additives are to be selected with confidence and costly field and full scale laboratory testing is to be eliminated. The petroleum industry is devoting much effort to the solution of this problem.

JUNE, 1951 ISSUE

Number 4

SUBJECT—TEXTILE SPINDLES AND THEIR LUBRICATION

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NLGI GRANTS FELLOWSHIP

Mr. Howard Cooper, President of the National Lubricating Grease Institute, announces that an NLGI Fellowship has been granted to the University of Southern California. It's general scope will include the study of the fundamental physical chemical basis on the observed behavior of lubricating greases.

Dr. Robert D. Vold, head of the Department of Chemistry, will direct the work and extend the results already accomplished in this field. In the past such scientific information has been maintained by pure research in University laboratories, and such research is ordinarily beyond the scope of the small manufacturer. The results to be obtained from this fellowship grant will be an aid to the small, as well as the large manufacturer, and will develop a basic knowledge in the more highly trained scientific personnel for the lubricating grease industry through the training of University students. The type of research contemplated will be composed entirely of fundamental research, with trained personnel available for its performance.

It is felt by the officers of NLGI that this long-range program will be of great value towards maintaining the proverbial leadership of American industry which has been expressed through faster and more efficient machinery. It is believed that the studies resulting will be a decided factor in producing a product that will mean longer life for bearings and conservation of valuable equipment.

abstracts—convention papers

The following abstracts of the papers to be presented at the 1951 Annual Convention of ASLE are published herewith for general information and to stimulate discussion at the meeting. They do not necessarily represent the final opinion of the authors and are subject to revision when the full papers are formally published.

PLANNED LUBRICATION IN IBM

BY W. L. LEWIS
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It is imperative that American industry realize the importance of a controlled lubrication program in attaining the maximum production necessary to carry out the defense program of our country and maintain our peacetime production on a high level.

IBM has for a number of years maintained a separate department for planning and supervising the lubrication of all production tools and plant facilities. The results—reduction in man and machine hours, closer control of machine condition, reduction in the number of lubricants required, and the reclamation and re-use of recoverable lubricants—have been accomplished at an actual saving in direct costs and with a substantial reduction in expense.

LUBRICATION, ITS IMPORTANCE TO PLANT FIRE SAFETY

BY RIDGELY G. SHEPHERD
Textile Engineer, Standards Dept., Factory Mutual Engineering Div., Associated Factory Mutual Fire Insurance Companies, Boston, Mass.

An analysis of almost 20,000 industrial fires rated friction as the second most important cause (14% of total), being exceeded only by electrical failures. Lack of proper lubrication is the direct cause of most fires caused by friction. For example, a survey of over 200 prominent southern cotton mills during 1944-45 disclosed that over 40% had never had a lubrication survey made. These mills averaged over 30% more fires.

Any plant supporting a highly efficient lubrication procedure is invariably a safer plant from both a personnel and a fire hazard point of view. The importance of planned lubrication is stressed and methods of obtaining this are presented.

STORAGE AND DISTRIBUTION OF LUBRICANTS

BY O. M. ALBL
Tapco Division, Thompson Products Co., Cleveland, O.

One of the more important phases of planned lubrication is the storage and distribution of lubricants. This article includes all factors which must be considered from the time lubricants are received in a plant until they are consumed.

Economies possible in personnel, maintenance, down time of machinery and overall cost of lubrication are stressed. Points included are the proper storage of lubricants, methods of distribution to sub-stations and lubricant protection at such points, stock control, proper application to machines, scheduling use of pipe lines vs batch transfer, fire protection and many others.

LUBRICATION OF KNITTING MACHINERY

BY F. K. FOGLEMAN
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The very nature of knitting machinery of various types is such that the problem of its proper, successful, and economical lubrication has changed but little over a period of many years. Lubrication does, however, play an extremely important part in the operation of this equipment.

Various specifications have been developed over the years that tend to insure the use of the proper lubricant for a specific purpose. It should not be necessary for the average knitting mill to stock more than two grades of machine oil and one grease in addition to a compound or highly refined straight mineral oil for use on parts that come in contact with the fabric.

It is well to remember that in the lubrication of knitting machinery it is best to limit the use of oil in the application to the least amount that will adequately lubricate the working parts involved. With the present three-shift-day operation prevalent in the industry, it is only through proper maintenance and lubrication of this equipment, using the highest grade lubricants available, that satisfactory production can be maintained over a long period of time.

LUBRICATION IN THE TEXTILE INDUSTRY

BY K. M. LOWRY
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The many problems in textile machinery lubrication are outlined. These include not only the type of lubricants used and methods of application, but bearing, gear, and seal design, also maintenance and the responsibility of management.

Each of these problems are analyzed in detail, with explanations given for their cause, their effect and their possible solution. The final answer to most of the problems outlined can only be obtained through the cooperation of mill management, the lubricant supplier and machinery manufacturers.

ADVENTURES IN LUBRICATION

BY DONALD F. WILCOCK
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How many of us would be working in the field of lubrication if it did not contain some element of adventure, or some promise of new experience. Included in this highly interesting article is the Case of the Missing Molecule, the Case of the Brass-Plated Bearings, the Story of the Sleeve Bearing Cyclone and the Case of the Inverse Lubricant.

In each of these "who done its" there was real adventure, some element of danger, and a real lesson to be learned.

OIL DETERIORATION IN THEORY AND PRACTICE

BY R. G. LARSEN, Manager and H. DIAMOND, Chemist, Lubricants and Fuels Department, Shell Development Co., Emeryville, Cal.

In industry, mineral oils are called upon to perform several functions, e.g., as lubricants, coolants, and dielectrics. Hydrocarbon in contact with air is a thermodynamically unstable system and deterioration in service is generally due to the formation of small amounts of oxidation products that interfere with some phase of normal operation. Rate of aging is controlled by three factors: concentration of reactants, temperature, catalysis.

Proper design of machinery and use of antioxidant or anticatalyst additives will decrease the rate to a minimum. Alternatively, means may be employed to counteract the effects of oxidation, such as detergent additives that peptize insoluble products, basic additives that neutralize acids, corrosion inhibitors that protect metal surfaces, and mechanical filters that remove sludge.

Examples are given of practical applications of fundamental principles, namely, to internal-combustion engines, steam turbines, hydraulic equipment, torque converters, annealing, heat transfer, and electric transformers. Various uses impose widely different requirements so that no universal lubricant has yet been found. Fortunately, however, products have been developed that combine several desirable qualities and therefore fulfill many purposes.

THE MECHANISM OF GRINDING AND THE FUNCTION OF THE LUBRICANT

BY JOHN O. OUTWATER *
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The behavior of single grains of abrasive in contact with the metal will be extended to show how the chemical reaction between the metal being ground and the atmosphere in which it is ground is a dominating factor in grinding. The lubricant will be shown to be effective only after the cutting has been done and that its effect on cooling the surface of the metal is negligible, its purpose being to prevent the bulk of the metal from overheating and to reduce the friction between the severed chip of metal and the bulk of the uncut metal.

* Current position — Field Engineer, E. I. du Pont de Nemours & Co., Wilmington, Del.

A STUDY OF RUST PREVENTIVE PROPERTIES OF GREASES

BY R. J. BURGER, R. RUBIN and E. M. GLASS
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As a result of numerous complaints of corrosion of wheel bearings of aircraft in semi-storage conditions, an investigation into the rust preventive properties of wheel bearing greases was initiated. Concurrent studies were carried out in the laboratory and in service aircraft.

A laboratory procedure using ball bearings was developed which showed correlation with service results. The investigation was then enlarged to include many different types of greases. These included petroleum, diester, Ucon oil and silicone greases. Several factors influencing the degree of corrosion resistance were investigated. The effect of rust inhibition was noted.

The results to date indicate that certain properties such as high alkalinity and some water-emulsifiability with a degree of water resistance are useful in controlling the degree of corrosion protection which a grease affords to a coated bearing surface. In the case of diesters great difference in corrosion protective qualities exist among different classes of diester greases.

Finger print suppression appears to have a role in protection against corrosion of steel surfaces under service conditions.

The investigation is continuing. The factor of bearing rotation is being studied and an investigation of these greases in a tester employing dynamic conditions is underway.

HIGH TEMPERATURE, HIGH SPEED GREASE APPLICATIONS

BY E. H. ERCK
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Integral points of ball bearings are defined with illustrations to show the mechanics of operation at high speeds, and the merits of such bearings.

A relationship of consistency of greases, their structure and tenacity has been evaluated at high speeds and high temperature. The relative motion of the grease reserve during operation was also studied.

The effect of high temperatures on the anticipated life of the lubricant as well as the metallurgical-physical changes in components of ball bearings are explained.

SOME PROBLEMS ENCOUNTERED IN THE USE OF SOLUBLE OILS

BY A. W. LINDERT
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The development of bluish-black stains on fine-ground iron surfaces appear to occur according to the following mechanism:

1. Solution or dispersion of iron as ferrous compounds in the soluble oil emulsion.
2. Oxidation of the ferrous compounds to ferric compounds.
3. Flocculation and precipitation of the ferric compounds on freshly ground iron surfaces during the evaporation of water from the emulsion film.
4. Development of ferrous-ferric oxides on the metal surfaces through an oxidation-reduction reaction of the metal with the deposited ferric compounds.

In addition to development of foul odors in emulsions, bacteria appear to be a factor in stain development. Bacteria encountered in these studies belong to the genus *Pseudomonas* or *Achromobacter*. Many commercial germicides are inadequate for control of these organisms in soluble oils.

LIQUID AND VAPOR PHASE CORROSION INHIBITORS

BY H. R. BAKER and W. A. ZISMAN
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Progress of post-war research is reported on polar-type rust inhibitors. New material is presented on: the structure of soaps and of amine-acid complexes, the colloid state of polar compounds in non-aqueous systems, adsorption on metals, and the mechanism of cor-

rosion inhibition. Advances in rust inhibition test methods are reviewed including recent work on vapor-type inhibitors.

THE NATURE AND USE OF PETROLEUM BASE RUST PREVENTIVES

BY H. B. CARPENTER
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Products in this category have achieved considerable prominence during the past decade. They are used principally for the protection of finished iron and steel surfaces where the use of paint or a metallic coating is unsuitable. In addition to their rust preventive properties they are characterized by ease of application, ease of removal and their lubricating nature.

Straight petroleum oils or slushing compounds are not reliable rust preventives, but this limitation has been overcome by the use of inhibitors.

The four principal types of petroleum base rust preventives are described: namely, plastic, fluid, thin-film, and solvent. Various typical uses are discussed such as, machinery during shipment and storage, spare parts, anti-friction bearings, hydraulic devices and systems, gear cases, turbines, power transmission devices, instruments, farm machinery, strip and sheet steel, parts in process, etc.

Application and removal are also covered.

WIRE ROPE LUBRICANTS AND LUBRICATION

BY JOHN P. CRITCHLOW
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Staff Engineer, Gulf Oil Corp., New York, N. Y.

Wire rope lubrication is highly specialized, and its importance from a safety as well as maintenance viewpoint, cannot be overemphasized.

Various types of wire rope lubricants and their merits are discussed. Performance data obtained in the field and on special laboratory equipment are presented. Materials for treating and lubricating hemp centers are included.

EVALUATION OF LUBRICATING PROPERTIES OF DRAWING COMPOUNDS

BY WESLEY J. WOJTOWICZ
Vice President and Director of Research, H. A. Montgomery Co., Inc., Detroit, Mich.

A method of evaluation of the lubricating properties of drawing compounds is presented. The principle is essentially the determination of the magnitude of the coefficient of friction. This quantity is obtained by determining the power consumption during the passage of a metal test strip through a set of loaded, flat steel dies.

A discussion of both oil and emulsified type drawing compounds is presented. High viscosity is the predominant factor in good lubricants. Polar characteristics are best distinguished in conjunction with chemically prepared surfaces, e.g. pickled or phosphated. In other instances polar additives do not apparently improve lubricity.

The character and per cent of emulsifier are of greatest importance in the determination of the lubricating properties of emulsions. Type of diluents used in industry may seriously alter ultimate performance. Slight variation of surface roughness may seriously affect performance of emulsified compounds. In general, emulsion stability and lubricity are inversely proportional.

AUTOMOTIVE DRAWING COMPOUNDS CHARACTERISTICS AND APPLICATION

BY JAMES T. O'REILLY
Supervisor, Manufacturing Research Department, Ford Motor Co., Dearborn, Mich.

Drawing compounds are lubricants to control friction caused essentially by momentary welding of the contacting molecules of the surfaces sliding against each other. Extremely high pressure and slow movement favor very thin films absorbed by chemical or physical forces.

Emphasis in final specification evaluation will continue to be on more thoroughly controlled shop trials until laboratory performance tests really correlating with production experience are developed and accepted by the automobile industry. Material specifications additionally provide laboratory screening and quality control tests for weldability, stability, toxicity, rust protection, washability, viscosity, solids, and application characteristics. At the Ford Motor Company, process specifications also assist in seeing that the right amount of the specified drawing compound is correctly applied.

For mild draws and simple bends, dilute soap solutions or mineral oil is generally used. For medium drawing, addition of polar compounds or sulphurized oil is common. For severe drawing, fillers and reactive compounds are often used to give extreme pressure ("E.P.") characteristics. Phosphate coating and the use of dry soaps and plastic films as drawing agents are finding increased acceptance for special applications.

Only such preprints, as are provided through the courtesy of the authors, will be available for distribution at the Convention. The full text of the entire Convention proceedings will be published through the columns of this Journal as rapidly as space permits. If you are not an ASLE member, we urge you to send in your subscription at once. You cannot afford to miss one issue of LUBRICATION ENGINEERING.

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LUBRICATION, ITS IMPORTANCE TO PLANT FIRE SAFETY *

by R. G. Shepherd, Engineer
Factory Mutual Engineering Division
Boston, Mass.

Mr. Shepherd spent 25 years with Alden Speares Sons Co., and the New England Div. of the Galena Signal Oil Co. of Cambridge, Mass. His duties were those of Chief Chemist and Field Supervising Engineer. In those capacities his work consisted primarily of lubrication problems applying to mill, transportation and power plants. For the past ten years Mr. Shepherd has been affiliated with the Factory Mutual Engineering Div. specializing in textile and lubrication subjects.
Mr. Shepherd was a member of the Lubrication Committee of the Textile Div. of ASME for two years serving as chairman of one of the sections.

ABSTRACT

An analysis of almost 20,000 industrial fires rated friction as the second most important cause (14% of total), being exceeded only by electrical failures. Lack of proper lubrication is the direct cause of most fires caused by fricton. For example a survey of over 200 prominent southern cotton mills during 1944-45 disclosed that over 40% had never had a lubrication survey made. These mills averaged over 30% more fires.
Any plant supporting a highly efficient lubrication procedure is invariably a safer plant from both a personnel and a fire hazard point of view. The importance of planned lubrication is stressed and methods of obtaining this are presented.

Any plant supporting a highly efficient lubrication procedure is invariably a safer plant from both a personnel and a fire hazard point of view. The principal aim of this discussion is to illustrate the direct relationship between efficient lubrication and plant fire safety. Either program, to be successfully carried on, should include the important features of the other.

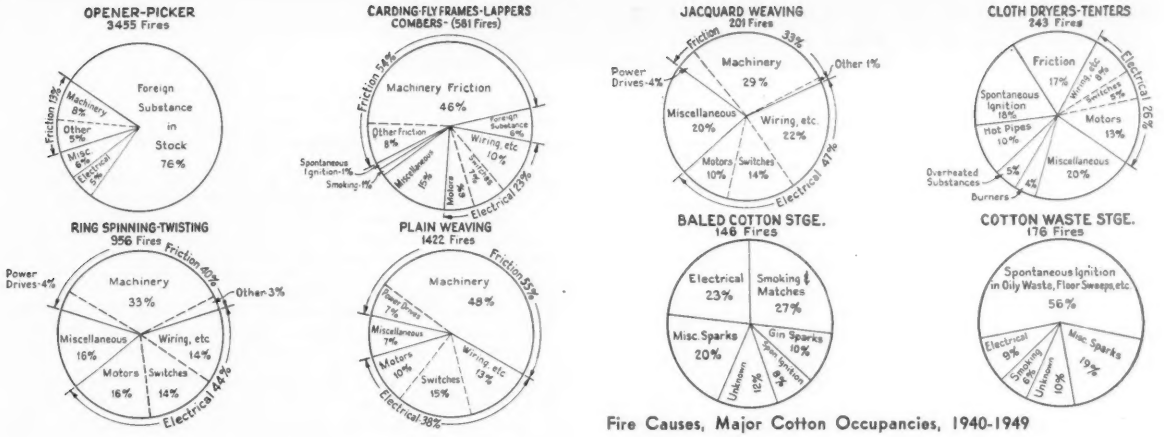
From a recent analysis of almost 20,000 fires, friction rated second place as a direct fire cause (14% of total), being exceeded only by electrical failures. It is also strongly suspected that many fires supposedly of electrical origin were actually caused by overloaded circuits as a result of excessive machine friction. Numerous electrical problems have been corrected by improved lubrication methods. The two figures include all types of friction, such as misaligned or broken machine parts, material chokes, etc. Any corrective study of plant lubrication should include these defects.

Anything that reduces fire losses helps to keep down the cost of insurance as well as to make the plant safer for employees and to avoid interruption of production. This concept was the basis of the origin of the Factory Mutual System. Over 100 years ago, a small group of Rhode Island textile millmen, having developed a high interest in plant safety conditions, approached their underwriters with a request for a reduction in the high fire insurance rates in force at that time, about $1.75 per $100 of insurance. They believed that because of their keen interest in plant protection they warranted such consideration. After receiving a polite but firm refusal, this enterprising group of individuals then undertook the underwriting of their own insurance, partially at first as a precaution, but later assuming the entire amount. This was the start of the Factory Mutual System. High standards for all important plant safety conditions were an absolute must, with frequent inspections to assure that these standards were thoroughly maintained. From that small inauspicious beginning, the Factory Mutuals grew, and as the years went by, the founder's established policy of improving plant conditions returned rich dividends in the way of added safety, greater plant efficiency and, of course, greatly reduced premiums. Today, over 28,000 of the nation's leading industrial plants are in the Factory Mutual System.

The Factory Mutuals early became interested in machine lubrication. In 1875 original research was published on the comparative values of lubricating oils and greases available at that time. This work was initiated by Edward Atkinson in cooperation with his close friend Wm. Barron Rogers, founder of Massachusetts Institute of Technology. Most of our early policies covered cotton textile factories with their numerous fire hazards. Although the machinery of the time was slow moving and of crude construction, excessive dirt and vibration made lubrication difficult. Available lubricants were lard oil, sperm and tallow. This added to the problems of housekeeping, spontaneous combustion, storage and application.

It was not until after the introduction of electric power with its greatly increased machine speeds that more intense studies were instituted, patterned after the original idea of Mr. Atkinson. No doubt, the auto-

* Paper to be presented at 6th Annual Convention of A.S.L.E., Philadelphia, April 16, 1951.



Fire Causes, Major Cotton Occupancies, 1940-1949

mobile had more to do with encouraging lubrication research than any one machine.

Before and during the early days of electrically-powered machinery, if a textile mill was having too many friction fires, it was customary practice for mill men to go either up or down river, seeking information from other factories on the kinds of lubricants used for similar operations. Information then would be carried back to the mill with the complacent feeling that a real service had been done and the trouble corrected. In most instances the results were not too satisfactory and oftentimes it was difficult to explain "why." As a matter of fact, it has only been a short time since industry as a whole has taken the matter of lubrication seriously and approached their problems from a scientific standpoint. It was not so long ago that the "thumb and forefinger" method of testing lubricants was common. We have but to mention the textile industry again as an example. Prominent machinery manufacturers, lubricant suppliers and textile mills have actually made progress only during the last few years. A survey of over 200 prominent southern cotton mills during 1944-45 disclosed that over 40% had never had a lubrication survey made. These mills averaged over 30% more fires.

Today Factory Mutual's procedure is about as follows: When frictional fires persist, we inquire what lubricants are being used, how the mill supervises their application and whether the lubricant supplier furnished proper engineering advice. Written recommendations by the supplier are preferred, based on the mill's particular conditions. Also, it is important to know whether recommendations are frequently checked to see that they are properly followed. In no case is a special lubricant permitted either to be recommended or criticized by our engineers unless the lubricant supplier shows deliberate lack of interest in furnishing information when requested by the mill to do so. This rarely occurs. Where failures persist, we often suggest that lubricants be purchased from as few manufacturers as possible and that the variety of lubricants be reduced to the lowest number. Maximum interest is usually promoted if one lubricant manufacturer has the entire responsibility for a plant's lubrication performance. We do not favor price buying under any consideration. We appreciate that the finest machine construction, the most accurate bearing tolerances or expertly manufactured lubricants may not be capitalized upon unless machine maintenance and lubrication services are properly engineered and carried out. Accurate maintenance cost records are suggested.

The lubrication in any plant or group of plants should be under the direct supervision of one qualified engineer who assumes complete authority and responsibility for the plant's requirements. While it is not always possible to establish close specifications by laboratory examination for competitive purchasing, it is advantageous to know enough of the physical properties to check for quality uniformity. It is not fair to adopt recommendations such as "use such and such a brand oil or equal" unless the manufacturer furnishes sufficient information to determine quality.

Good machine lubrication begins with proper storage and dispensing of lubricants. They should be kept in a well-arranged room reserved for lubricants only. Storage tanks or drums equipped with pumps are desirable because they dispense lubricants quickly and reduce spillage. It is important that the different oils and greases be clearly indentified. The careful control in manufacturing and packaging of lubricants for effective performance can be completely nullified through careless methods of the user. These conditions are frequently checked by our field engineers and many reports contain recommendations for improvements. Quite often the inspectors are in a better position to check such conditions than the lubricant suppliers themselves as our inspections require visits to all areas of the plant.

It appears most necessary that the combined interests of the lubricant producer, the manufacturer of equipment in question and the consumer be coordinated by a program of continuing interest to one another. We realize that the machinery manufacturer does not always have the opportunities to visit a plant and inspect the performance of his machinery under all conditions. Usually the lubricant supplier is not called in unless some fault develops. On the other hand, whenever friction becomes serious enough to cause a fire we always hear about it. I wish to assure you that it is our aim to assist in improving conditions in a manner which meets with the approval of both the lubricant supplier as well as the machinery manufacturer. For this reason we are attempting to make the acquaintance of all the prominent firms in question. It has proved to be of mutual benefit and it definitely makes it easier to discuss questions more intelligently as they arise.

Your society has a most important part to play in industry and rightfully should include the large savings in machine wear and in fire losses as an important part of your program along with power, production and maintenance costs. I appreciate the opportunity of presenting our viewpoint and we are anxious to cooperate in the excellent work you are now doing.

LUBRICATION PANEL

The subject matter presented below, in abstract form, represents the participation of our Society in the recent Plant Maintenance Show, held in Cleveland, Ohio.

This second Lubrication Panel, which attracted an audience of over 1,500 people, attests to the growing awareness of the need for information on the subject of proper lubrication. The Panel was ably chaired by C. L. Pope, Lubrication Engineer, Eastman Kodak Co. Mr. Pope is a past President of ASLE and present Chairman of the Presidential Council. Mr. Pope and members of the Panel are all men outstanding in their knowledge of, and contributions to, the field of lubrication.

The questions from the floor were so numerous and varied that, although an extension of time was granted, it was impossible to discuss all of the questions submitted.

The entire proceedings of the three-day Conference Sessions, including the full text of the papers presented at the Panel and all questions and answers, will be published in book form. Arrangements have been made to include Panel Members' replies to those questions which remained at the expiration of the time limit.

THE "CONFERENCE PROCEEDINGS" WILL BE AVAILABLE AFTER MAY 1, 1951. PRICE $6.00. ORDER YOUR COPY FROM CLAPP & POLIAK, 341 MADISON AVE., NEW YORK 17, N. Y. (ALL REGISTRANTS PAYING THE $6.00 REGISTRATION FEE WILL RECEIVE THE "PROCEEDINGS" WITHOUT COST.)

by D. F. Hollingsworth

E. I. Du Pont de Nemours & Co.
Wilmington, Del.

Lubrication in a chemical plant is different from that in other industries due to operating conditions and the presence of chemicals undergoing reactions. A lubrication engineer in this industry must have a broad knowledge of the lubricants and operating conditions.

As in all industries, the machines must be designed for adequate lubrication, and lubricants must be purchased and delivered at the proper time and in the proper quantity. This implies consolidation of lubricants to an absolute necessary minimum number and effective cooperation with the Purchasing Department.

Lubrication engineers are a must for any company in any industry which hopes to keep maintenance costs low and production high. Such an engineer must schedule the lubrication and inspection of each machine. He must handle trouble-shooting as required and he must keep abreast of the developments in his field. An effective lubrication program can reduce the number of safety hazards in a plant due to lubrication. The lubrication engineer can do much to eliminate unsafe working conditions. However, like safety engineers, they must be sold from the top down. Lubrication engineering must be directed from the central offices by a management which must insist on sound lubrication practice.

by D. P. Morrell

Ford Motor Company
Detroit, Mich.

An important aspect of preventive maintenance which has not received proper consideration in the past is good maintenance features in the design of industrial equipment. A designer should consider bearing areas and avoid excessive loading conditions which require special lubrication. He should make provisions in the design for easy removal and replacement of bearings. Centralized lubrication systems should be considered. One of the most important design functions is to show all pertinent service information on suitable charts and diagrams for use by shop personnel.

The Ford Motor Company has recognized the need for such a program and has instituted a committee to properly implement the program. As a result of the efforts of this group, a set of standards has been published entitled "Lubrication Standards for Industrial Equipment." These standards are based on good engineering practices and, as such, point out a goal in regard to performance and service accessibility which permits the manufacturer the full scope of his experience and ingenuity in the design of equipment.

by W. M. Schuck

Armco Steel Corp.
Middletown, Ohio

The modern steel mill has lubrication problems in common with most other industries with the exception of those caused by two situations. These special conditions are imposed because of equipment shock loading and equipment size and complexity.

Correct equipment design is probably the most important single factor affecting successful lubrication. Thus today the problem of lubrication in the presence of extremely high temperatures does not exist in the steel industry mainly due to design studies.

The next requirement of a good lubrication program is the care and maintenance of the lubricants in use. This involves periodic sampling and inspection of lubricants in use so that deterioration can be anticipated prior to its occurrence. This inspection should be simple but searching in order to eliminate ambiguities in the data interpretation.

Centralized grease systems are receiving more and more attention and emphasis in the steel industry. Personnel safety, elimination of human error, and definite lubrication protection are only a few of the gains to be realized through this modern aid to the lubrication program of the progressive plant. The increased costs of such automatic dispersing equipment are fully justified where cost complexity and important key equipment is concerned.

Another very important factor to be considered is the training of the personnel responsible for the success of the lubrication program. Without a definite and ambitious training policy, all lubricant programs will fail in some degree. The degree of success of the program will be a measure of the personnel who are directly concerned with the prosecution of it.

by LeRoy Miller

Scott Paper Company
Chester, Pa.

Many of the lubrication problems of the paper-making industry are common to all. However, in this industry, complications are caused by the necessity of around-the-clock production on an integrated continuous line production system. In such a system, the failure of any one component, regardless of size, will cause the whole process to stop.

Since the lubrication engineer has, in the main, only empirical knowledge to guide him, he is forced to lean heavily upon observation, analyses, experience and judgment. All maintenance problems are specific, concrete and generally immediate.

Lubrication engineers must be aware of the commonplace and recognize all factors involved since trouble usually develops from an inability to do so. For instance, the drier rolls in paper plants are heated by live steam at 20-150 lbs. pressure which is introduced into the roll interior through hollow journals. This steam causes the oil lubricating the roller bearings on the journal to reach an average exit temperature of about 130 F. We must not stop at this point and say that this temperature then is the cause of deterioration since it has been shown that some of this oil actually reaches a temperature of 400 F. and it is this oxidized oil which starts a chain reaction which leads to ultimate oil deterioration.

While many factors modify the choice of the lubricant for a particular application, it is the film strength of the oil which is its important basic characteristic. A realization of the number of factors which contribute to a lubricating situation and the number of different lubricant characteristics indicates the necessity for a lubricant specialist who is also familiar with operating conditions.

by L. B. Sargent, Jr.

Aluminum Company of America
New Kensington, Pa.

Because few basic laws have been formulated concerning the use of industrial lubricants, each new application has meant a new lubricant in many cases. This situation has resulted in a multitude of oils and greases on the market. Such specialized lubricants have cluttered up inventories, increased paper work, increased lubrication costs and hindered the efficiency of maintenance.

Many industries are now scientifically streamlining their lubricant situation by the judicious use of multi-functional lubricants. For instance, we at one time used 850 different maintenance lubricant items on a Company-wide basis but are now down to about 150. One of our plants, for example, is now using 1 grease in place of the 1 dozen which it formerly stocked. This has improved considerably the purchasing situation and has resulted in lowered initial costs and a lower cost of maintenance.

It has been shown that respectable economies can be realized by a thorough study of one's lubrication requirements with consolidation of lubricants as the primary objective. Thus, far reaching consolidation of the number of lubricants used can be made without harming the machine efficiency or maintenance. Such a study, when results are in practice, will decrease inventories, storage space required, initial costs, and paper work, and will allow contract buying and improved flexibility on the part of the Purchasing Agent, and a better insight into lubricating performance with a good possibility of decreasing hidden repair and maintenance costs.

by W. T. Witt

Tennessee Eastman Corp.
Kingsport, Tenn.

Lubrication is a very important phase of the operation of a textile plant due to the continuous operation and thousands of bearings needed. More electrical motors are used in this industry than in any other. By thorough training of personnel involved and by use of rigid inspection and lubrication schedules, industry has been able to increase the efficiency of the equipment and reduce the maintenance and repair costs.

Under good operating conditions, an electrical motor may operate 9 or more years between greasings. In general, it is bad practice to over-lubricate; however, in the textile industry one also has to consider the contamination of the yarn by excessive oil or greases. There are many places where an oil and grease must be used sparingly. The use of a ball bearing grease that will lubricate for long periods is desirable for this reason as well as for the savings on material and labor.

Efforts are now being made by means of an organized economical plant lubrication program to consolidate lubricants and eliminate unnecessary and obsolete ones. At one time some 57 different lubricants were being carried in stock. The work of the program has now reduced this number to 8 oils and 3 greases.

In order to improve the current situation with regard to plant lubricants, it is necessary that closer cooperation be formulated between plant maintenance personnel and the plant lubrication engineer.

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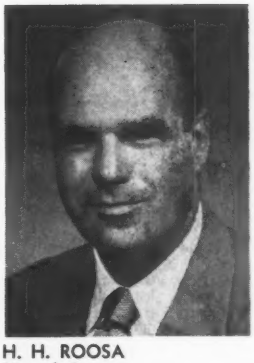

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Sixth Annual Convention and Fourth Annual Exhibit

THE AMERICAN SOCIETY OF LUBRICATION ENGINEERS

Mon., Tues., and Wed., April 16-17-18, 1951

HOTEL BELLEVUE-STRATFORD — PHILADELPHIA, PENNSYLVANIA

MONDAY, APRIL 16, 1951

9:00 A. M. — REGISTRATION — 18th Floor
Hotel Bellevue-Stratford

Official Opening of Exhibits

11:00 A. M. — GENERAL SOCIETY BUSINESS MEETING

ROSE GARDEN

Chairman: M. E. Dougherty

President's Message—D. F. Hollingsworth
Secretary's Report—W. F. Leonard
Treasurer's Report—O. L. Maag

12:30 P. M. — WELCOME LUNCHEON

CLOVER ROOM

Speaker: Don Rose

Chairman: C. H. Foster

Welcome to Philadelphia by the Honorable Bernard Samuel, Mayor of the City of Philadelphia.

2:15 P. M. — OPENING TECHNICAL SESSION

ROSE GARDEN

Chairman: Frank Ross

SESSION 1

*"Planned Lubrication in IBM"**—W. L. Lewis, International Business Machine Corp.

"Lubrication, Its Importance to Plant Fire Safety"—R. G. Shepherd, Factory Mutual Engineering Division.

"Storage and Distribution of Lubricants"—O. M. Albl, Thompson Products Co.

* Sponsored by Technical Committee on Lubrication Economics

Exhibits Open to 10:00 P. M.

TUESDAY, APRIL 17, 1951

7:30 A. M. — Breakfast for authors and chairmen.

PINK ROOM

9:00 A. M. to 12:00 Noon

NORTH GARDEN

Chairman: A. W. France

SESSION 2-A

"Lubrication of Knitting Machinery"—F. K. Fogleman, Textile Machine Works.

"Lubrication in the Textile Industry"—K. M. Lowry, Deering Milliken.

Discussors: 1. B. M. Dunham, Sun Oil Co. 2. O. A. Johnson, Saco-Lowell Shops. 3. R. E. Getchell, B. F. Perkins and Sons, Inc.

9:00 A. M. to 12:00 Noon

ROSE GARDEN

Chairman: J. C. Geniesse

SESSION 2-B

"Adventures in Lubrication"—D. F. Wilcock, General Electric Co.

"Oil Deterioration in Theory and Practice"—R. G. Larsen and H. Diamond, Shell Development Co.

"The Mechanism of Grinding and the Function of the Lubricant"—J. O. Outwater*, Massachusetts Institute of Technology.

* Currently with E. I. du Pont de Nemours & Co.

Exhibits Open to 6:00 P. M.

Program

TUESDAY, APRIL 17, 1951 (Continued)

2:15 P. M. to 5:00 P. M.

ROSE GARDEN

Chairman: R. J. Ulrich

SESSION 3-A

"A Study of Rust Preventive Properties of Greases" —R. J. Burger, B. Rubin & E. M. Glass, Air Materiel Command, Wright-Patterson Air Force Base.

"High Temperature, High Speed Grease Applications"—E. H. Erck, Bendix Aviation Corp.

2:15 P. M. to 5:00 P. M.

NORTH GARDEN

Chairman: J. H. Dunigan

SESSION 3-B

"Evaluation of Lubricating Properties of Drawing Compounds"—W. J. Wojtowicz, H. A. Montgomery Co., Inc.

"Automotive Drawing Compounds Characteristics and Application"—J. T. O'Reilly, Ford Motor Co.

"Some Problems Encountered in the Use of Soluble Oils" — A. W. Lindert, Standard Oil Co. of Indiana.

7:30 P. M.—ANNUAL BANQUET

BALLROOM

Toastmaster: Dudley D. Fuller

Speaker: Henning W. Prentis, Jr., Chairman of the Board, Armstrong Cork Company.

Introduction of New Officers.

Presentation of Awards:
Alfred E. Hunt Memorial Medal.
ASLE Honorary Life Membership Award.
Walter D. Hodson, Jr. Award

(Dress Informal)

Exhibits Open to 6:00 P. M.

WEDNESDAY, APRIL 18, 1951

7:30 A. M.—Breakfast for authors and chairmen.

PINK ROOM

9:00 A. M. to 12:00 Noon

ROSE GARDEN

Chairman: R. G. Leister

SESSION 4

"Liquid and Vapor Phase Corrosion Inhibitors"—H. R. Baker and W. A. Zisman, Naval Research Laboratory.

"The Nature and Use of Petroleum Base Rust Preventives"—H. B. Carpenter, Esso Standard Oil Co.

"Wire Rope Lubricants and Lubrication"—J. P. Critchlow and R. W. Flynn, Gulf Oil Corp.

9:00 A. M.—Plant Inspection Trip, Atlantic Research Laboratories, Philadelphia, Pa.

2:15 P. M. to 5:00 P. M.

ROSE GARDEN

Chairman: W. P. Green

SESSION 5

Internal Combustion Engine Panel (Marine, Railroad, Stationary, Bus and Truck — Diesel and Gasoline)

Chairman: Dr. W. P. Green, Armour Research Foundation of Illinois Institute of Technology. Panel Members: George Stevens, Worthington Pump and Machinery Corp.; C. A. Rosen, Caterpillar Tractor Co.; W. K. Simpson, General Motors Corp.; W. J. Pelizzoni, International-Plainfield Motor Co.; G. A. Round, Socony-Vacuum Oil Co., Inc.; K. L. Hollister, The Texas Co.; W. A. Wright, Sun Oil Co.

4:30 P. M.—BUSINESS MEETING OF OFFICERS AND DIRECTORS, ASLE

Exhibits Open to 6:00 P. M.

This program has been carefully planned to be of real value to men who design, operate and maintain today's highly complex industrial machinery. The American Society of Lubrication Engineers, its officers, and the Philadelphia Convention Committee extend a cordial welcome to all those interested, to attend the technical and social functions listed above.

Registration fees: Members, $1.00; Non-Members, $3.00, of which $2.00 may be credited towards membership dues in the Society if application is made within thirty days, after the Convention.

Additional notes and comments relative to the Convention will be found on other pages of this issue.

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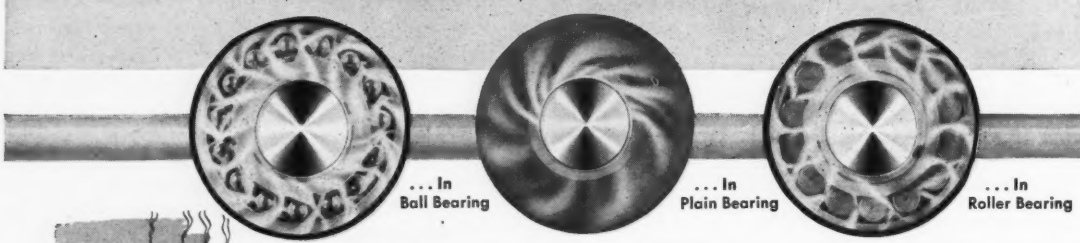

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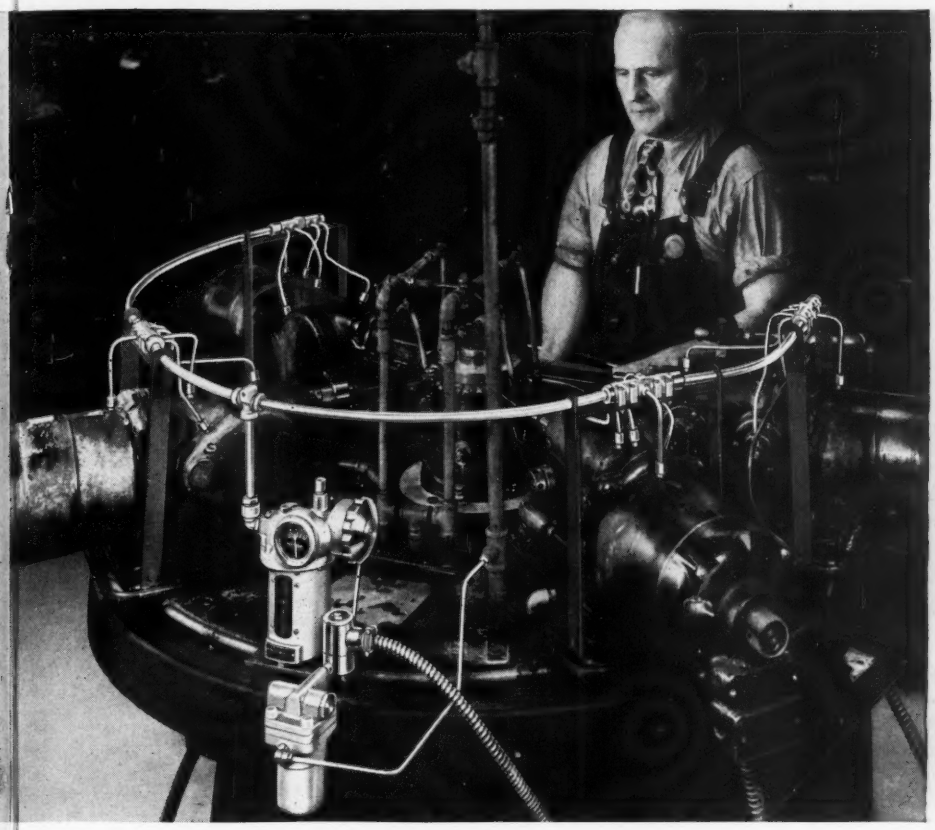

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3. Elimination of Guesswork

Every bearing picks up only as much Oil-Mist as it needs. No bearing can be overlooked. None gets over-lubricated.

4. Reduction of Bearing Temperatures

Oil-Mist acts as bearing coolant, can lower bearing temperatures as much as 20°F.

5. Reduction of Types of Oil

Oil-Mist greatly reduces the number of oils that must be stocked, handled, and applied.

6. Elimination of "Down-Time"

All bearings in the system are constantly lubricated while the machine continues to produce.

7. Extension of Bearing Life

Oil-Mist multiplies the life of bearings many times. The life of grinding machine bearings has been extended from 400 to 7,000 hours.

8. Consumption of Oil Cut 90%

The Oil-Mist System usually consumes approximately $\frac{1}{10}$ the amount consumed by any other oiling method.

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1850 Diversey Parkway, Chicago 14, Ill.

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

☐ Please send me information about Oil-Mist by mail.

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M. E. DOUGHERTY
Acheson Colloids Corp.

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The Atlantic Refining Co.

Mr. M. E. Dougherty, Chairman of the Philadelphia Section, and Mr. Charles H. Foster, Chairman of the Philadelphia Convention Committee, members of the various Committees, and the Philadelphia Section membership, take this opportunity to extend a cordial invitation to members and wives to attend the Sixth Annual Convention and Fourth Annual Exhibit in Philadelphia, Monday, April 16th, through Wednesday, April 18th.

"As Host Section, we are looking forward enthusiastically to the National Convention, and we urge you strongly not to miss it. A most interesting program has been planned, which we know will be of real value to our members. In addition to the technical and social features of the program, other entertainment has been arranged for the ladies. A visit to Philadelphia will be an experience to remember. This historical city has long been a cultural as well as a manufacturing center of the nation, and the inroads of industrialization leave it fundamentally unchanged. Here, fringed by the bustling hive of its industry, you will find the ingratiating charm of the past perpetuated in its many national shrines. Here, where the brilliance and scope of its industry is legendary, is also the ultimate in art, music, theatre. Come to see and learn . . . browse among the enchanting spots of our city . . . perhaps top it off with a jaunt to the nearby seashore. Treat yourself to a 'spring tonic!' Make your plans now to be with us—in Philadelphia!"

THE INDIVIDUALS LISTED BELOW ARE THE ONES INSTRUMENTAL IN ASSURING THE SUCCESS OF THE FORTHCOMING CONVENTION AND LUBRICATION SHOW:

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♥ This revolutionary cutting fluid is tops with metal cutting operators because Cimcool° makes jobs better. And no wonder! Cimcool is superior to old-fashioned coolants because it is a *chemical emulsion* incorporating a radically new and different principle in cutting fluids.

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♥ You'll get better production when you make jobs better with Cimcool. Let a demonstration in one of your own machines convince you. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, send for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U. S. Pat. Off.

Now—One grease will service all grease applications in the majority of plants

Gives ALL THESE PLANT SAVINGS:

1. **Extends TIME between greasings**—lasts longer . . . stays in bearings longer.
2. **Low-cost application**—fewer servicings and *only the one grease* to handle.
3. **Simple inventory**—Shell Alvania Grease replaces up to 20 brands formerly required.
4. **Better protection**—against heat, cold and moisture.
5. **Greater safety**—less chance of applying the wrong grease!

Gives ALL THESE LUBRICATION ADVANTAGES:

1. **Higher mechanical stability** than any conventional grease at operating temperatures.
2. **Pumpable at low temperatures**—even in unheated storage.
3. **Stable at high temperatures**—superior to the best "soda" greases.
4. **Impervious to water**—excellent resistance to washing out.
5. **Longer service life**—reduced consumption.

The "MILLION-STROKE" Industrial Grease!

A grease that will stand 100,000 punishing strokes of the ASTM Work Tester has been considered a superior lubricant.

In a deliberate attempt to break down Shell Alvania Grease, *on the same tester* the run was extended...200,000 strokes...300,000 strokes . . . 500,000 strokes! Finally, at one million strokes the test was discontinued, because this grease *would not break down*—it was still a fit lubricant both in appearance and consistency.

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Fourth Annual Exhibit Devoted Exclusively to Lubrication

3 IMPORTANT DAYS--

APRIL 16-17-18, 1951

HOTEL BELLEVUE-STRATFORD—PHILADELPHIA, PA.

The leading manufacturers of lubrication products have combined to bring out the actual value of lubrication as a functional part of plant production and maintenance.

SHOWING: LUBRICANTS, PETROLEUM AND SYNTHETIC—CHEMICALS —ADDITIVES—CUTTING OILS AND COMPOUNDS—SPECIAL OILS AND GREASES—LUBRICATION DEVICES FOR APPLICATION—FILTRATION—TESTING —HANDLING—GEARS—THE LATEST DEVELOPMENTS AND METHODS COVERING THE ENTIRE FIELD OF LUBRICATION.

PROPER LUBRICATION—*The Insurance Policy of Production*

Among the Companies Exhibiting Are

ALEMITE DIVISION OF STEWART-WARNER CORP.	Chicago, Ill.
ANDERSON OIL CO., F. E.	Portland, Conn.
ATLANTIC REFINING CO., THE	Philadelphia, Pa.
BOWSER, INC.	New York, N. Y.
CITIES SERVICE OIL CO.	New York, N. Y.
COMMERCIAL FILTERS CORP.	Boston, Mass.
CUNO ENGINEERING CORP.	Meriden, Conn.
DE LAVAL SEPARATOR CO., THE	New York, N. Y.
DOLGE CO., THE C. B.	Westport, Conn.
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FARVAL CORP., THE	Cleveland, Ohio
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GRAY CO., INC.	Minneapolis; Minn.
GULF OIL CORP.	Pittsburgh, Pa.
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LINCOLN ENGINEERING CO.	St. Louis, Mo.
McCORD CORP.	Detroit, Mich.
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NORGREN CO., C. A.	Denver, Colo.
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STUART OIL CO., D. A.	Chicago, Ill.
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• *EXHIBITION HALL—EIGHTEENTH FLOOR* •

APRIL 16 ..... 9 A. M. to 10 P. M.
APRIL 17-18 ..... 9 A. M. to 6 P. M.

MONDAY, APRIL 16
SPECIAL INDUSTRIAL NIGHT—6 P. M. to 10 P. M.

NEWS OF THE SECTIONS

CINCINNATI

By W. D. Whalen, Chairman
Section News Committee

"Lubrication in Industry" by D. F. Hollingsworth, E. I. Du Pont de Nemours & Co., Wilmington, Del., and President of ASLE—February meeting.

Modern lubricants have made possible the efficient operation of our high-speed production machinery which over the years has reduced human human slavery very greatly and raised our standard of living to the highest in the world.

The more than 240 billion dollars worth of goods produced last year could not have been accomplished without the aid of a few dollars worth of lubricants. Without lubricants, our steel mills, manufacturing plants, railroads, automobiles, etc., could not long operate.

The field of the lubrication engineer covers three important phases:

1. To give proper information and guidance to designing engineers so that machinery can be properly and efficiently lubricated.
2. To set up adequate specifications so that lubricants of the proper type and quality will be purchased. Also that the inventory may be held to a minimum.
3. To check on lubricants received. To set up a simple, but foolproof, system for using the right lubricant in the proper quantities, at the proper time, at a minimum overall cost.

NEW YORK

By William R. Whitaker
Magazine Correspondent

"The Lubrication of Power Plant Equipment," by F. C. Linn, G. E. Turbine Division—January meeting.

Turbine oils of today have been developed to a high point of efficiency, and progressed to the point where there are examples of continuous turbine operation over a 13-year period. A general requirement of a turbine operator is a minimum of three years operation with no shut-down for lubrication or mechanical failures. The oil must serve two principal purposes:

1. Lubricate the bearings.

2. Act as a lubricant and hydraulic oil for the governing mechanism.

In order to properly serve both capacities, the oil must overcome three main problems in turbine lubrication; namely, rusting (principally during shut-down periods), sludging and foaming.

Mr. Linn discussed the problems of gas turbine lubrication, touching on the influence of temperatures encountered, for in gas turbines, oils must perform at temperatures of 200 F. to 230 F. over long periods of operation.

During the showing of slides on several turbine lubricating systems, it was pointed out that the development of better filters and "oil polishing" equipment for turbine lubricating systems has been a large factor in prolonging the life of turbine oils, and consequently the turbines themselves.

In Mr. Linn's conclusion, he outlined what he feels is in the future for research and development of turbine lubrication:

1. The cleaning systems on turbines require better equipment to remove particles as fine as one or two microns.
2. Better rust preventives are needed to conform with specifications covering as high as 20 hour shut-down periods.
3. The life in heavy oils should be increased to compare with that of the light oils.
4. Equipment is needed that will test and predict accurately, foaming characteristics of an oil in actual use.

The annual "Ladies' Night" was held in February. The outstanding attraction was the guest speaker, Dr. Lillian Gilbreth, publically noted for her book "Cheaper by the Dozen." Her topic was not one that could be classed under "Lubrication Engineering," however, under the heading of "Industrial Management," Dr. Gilbreth spoke with authority and from a wide experience as Management Consultant. She outlined what many of these groups are trying to accomplish in such fields as industry, agriculture, medicine and education.

At the conclusion of the meeting, Chairman May presented Dr. Gilbreth with a parchment scroll honoring her appearance before the Section. Chairman May was presented with an autographed copy of "Belles on Their Toes."

ST LOUIS

By O. Wulfert, Chairman

"Maintenance and Servicing of Hydraulic Units for Machine Tools," by J. H. Groom, Manager, Field Service Dept., Cincinnati Milling Machine Co.—January meeting.

Mr. Groom covered the development of the mechanical feed of machine tools. Slides were shown, including lathes, planers, milling machines, and grinders. Some of the older designs were shown using screw or gears of complicated patterns affecting the change gear mechanism of the standard engine lathe. Apt comparison was made to the more modern hydraulic feed with a much simpler mechanism. The simple mechanism of the hydraulic control is confined principally to a plain piston and cylinder that can ordinarily be made with standard machine tools. The important factor being the extreme accuracy and high degree of finish required.

The high grade oil recommended for hydraulic units should last indefinitely but it is recommended that oil be examined several times a year. It is possible some times to filter the oil and this practice is followed by users having a number of machines. The usual practice is to replace the oil.

This same subject was presented before the Cincinnati Section last December, and other pertinent details were published in the February, 1951, issue of LUBRICATION ENGINEERING.

"Lubrication Engineering," by D. F. Hollingsworth, E. I. Du Pont de Nemours & Co., Inc., and President of ASLE—February meeting.

Mr. Hollingsworth discussed the organization of lubrication personnel and the responsibilities of the lubrication engineer in industry. In the past it has been quite customary to have various individuals responsible for specifying lubricants, thus relying on the knowledge of "many minds." Under modern conditions, it has been found necessary to apply a highly developed technique, and to place in the hands of one responsible individual the authority for the scheduling and application of lubricants. Where a lubrication engineer has been placed in charge of all lubrication activities in his plant, the following advantages are gained:

1. Elimination of the greater percentage of lubricants.
2. Reduced inventory of lubricants.
3. A specification of the proper lubricant for a particular purpose.

*POUR POINT

Today, it is essential to use the best lubricants money can buy — for maximum efficiency . . . lowest operating cost. That's why more and more production machinery is being lubricated with Tycol oils and greases.

Whatever your lubricating need — for turbine, steam engine, mine car or tipple, textile mill, stationary Diesel or locomotive — there's a Tycol high quality oil or grease exactly suited to your specific need.

In developing this comprehensive line, Tycol subjects each individual oil and grease to rigid tests during manufacture. This control assures the required lubrication characteristics — *POUR POINT, viscosity, color, penetration, to name a few — for maximum performance of that particular product.

Let us show you the extra value in every measure of Tycol oil and grease. Write your nearest Tide Water Associated office today.

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*LEARN WHAT THIS PRODUCT CHARACTERISTIC MEANS TO YOU — READ "LUBRICANIA"
This informative handbook, "Tide Water Associated Lubricania," gives clear, concise descriptions of the basic tests used to determine important properties of oils and greases. For your free copy, write to Tide Water Associated Oil Company, 17 Battery Place, New York 4, N. Y.

REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL

"This Lubricant kept 'em rolling in mud, muck and water"

—says J. O. Archibald of Redwood City, California

You may never have an earth moving job like this to do, but if you turn a wheel in any industry you can profit from Mr. Archibald's experience.

"The Leslie Salt Company called for bids for the conversion of 500 acres of salt marsh into crystallizing ponds for the production of bulk salt. The going was so tough that none of the several contractors invited to bid would take the job on a fixed price contract. Due to our success on similar work, the job was given to us on a cost plus basis.

"We moved in eighteen tractors as power units and the necessary Carryalls, Sheep Foots, Jeeps and other equipment. As soon as we removed the upper crust there was nothing but peat and marsh to run on. Tractors would sink in over the track rolls. To keep equipment rolling would require a special lubricant.

"Knowing from past experience that LUBRIPLATE No. 107 not only reduced friction to a minimum, but it also prevented rust even in salt water and would seal out the muck, we adopted it for track and general lubrication. We selected LUBRIPLATE APG-140 for all transmissions and final drives. The effectiveness of these two LUBRIPLATE Products is evidenced by the fact that during the entire job there were no replacements of track rollers nor were there any tie-ups of equipment due to replacement or breakage."

J. O. Archibald

Yes, LUBRIPLATE Lubricants are different!

They reduce friction, wear and power consumption, prevent rust and corrosion and last longer than ordinary lubricants. LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE Product best for your every lubrication need. Write for information about the use of them in your industry.

LUBRIPLATE DIVISION—Fiske Brothers Refining Company, Newark 5, N. J., Toledo 5, Ohio.

DEALERS EVERYWHERE—SEE YOUR CLASSIFIED TELEPHONE BOOK

LUBRIPLATE *THE MODERN LUBRICANT*

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ENGINEERS

GOOD OPPORTUNITIES

for

POWER ENGINEERS: Must have five to fifteen years' experience in some of the following: operating, testing and maintaining power plant equipment, supervising power plant operations, making cost and evaluation studies, heat balance work, power cost accounting, design and layout of power plants, and the selection and installation of power equipment. Must be graduate.

AIR CONDITIONING ENGINEERS: At least 7 years' experience in selection and operation of heating, air-conditioning, ventilating and refrigeration equipment. Well versed in the theory of thermodynamics, fluid flow and heat transfer. For consulting evaluation and economic operation services. Must be graduate.

MECHANICAL IMPROVEMENT ENGINEERS: Five or more years' experience in Machine Design and Development. Mechanical improvement work involving Stress Analysis, Lubrications, Vibrations and Fluid Dynamics with Mechanical Equipment such as Pumps, Compressors, Agitators, Bearings, Drives, etc. Must be able to apply higher mathematics in solution of mechanical problems. For consultation and evaluation work.

Give experience, education, age, references, personal history, salary received and salary expected. Please be complete and specific.

ALL INQUIRIES WILL BE CONSIDERED PROMPTLY AND KEPT CONFIDENTIAL

E. I. du PONT de NEMOURS & CO. (Inc.)

Engineering Department Personnel

Wilmington 98, Delaware

4. Establishment of proper lubrication procedure.

After the necessity of supervision of expenditures is realized, the successful executive will appreciate that the efficiency of a trained lubrication engineer will result in economy in purchases and inventory and that there will be savings in the operation of the plant.

LOS ANGELES

By Edward A. Mohr, Secretary

"Lubrication of Main Propulsion Power Plants Aboard Ship" by F. J. Hanly, California Research Corp.—January meeting.

Reasons for using emulsifying agents, usually rapeseed oil, for steam engines and the problems encountered were discussed. Steam turbine lubrication, the long life expectancy of modern turbine oils and problems encountered in cleaning turbine systems were brought out. The advantages of modern diesel engine lubricants aboard ship where high-output diesel engines are used and problems of purification made the difficulties found, clear. Gas turbines are so new and the lubrication problems encountered so comparatively uncomplicated that little time was spent on them. Slides were shown to illustrate the test results of various types of turbine oils.

"Alemite Equipment for Modern Application of Oils and Greases in Industry" by J. W. Frier, Asst. Sales Manager of the Industrial Div. of the Alemite Co. of Southern California—February meeting.

Devices for centrally controlled automatic and semi-automatic lubrication of multiple bearings were described. According to Mr. Frier, centralized lubrication systems eliminate the human factor, taking machine lubrication out of the hands of untrained personnel, and placing it in the engineering group.

The new mist method of oil application in which the bearings are lubricated by an air oil fog produced by atomizing the oil with compressed air, was the highlight of the meeting. A demonstration showed that the oil is so finely divided that it does not precipitate on the hands or clothing, yet readily precipitates when the oil vapor stream velocity is increased by constriction. This method of lubrication, developed by S.K.F. and purchased by Alemite, has been test applied in the Alemite plants for some time. This method of continuous centralized oiling during machine operation has been found effective up to 30 ft. main feed lines from the atomizer with 10 ft. branch lines, and for 20 to 30 bearings with a maximum of 60.

The only requisites are air, oil and velocity, with freedom of circulation. The mist contains 0.6% of a drop per cu. ft. of air, which has been found adequate for good lubrication without waste. The atomizer reservoir capacity is sufficient for approximately six 8-hour days, depending upon the number of bearings fed. The oil mist is not inflammable, and presents no health hazard. Any oil within reasonable viscosity limits can be atomized. One of the main benefits derived is that a single lubricant can be used over a very wide range of applications.

CLEVELAND

By Warren H. Bruns, Secretary

"Centralized Lubrication" by Ward Holland, Lubrication Engineer, Republic Steel Corp.—February meeting.

The advantages and reasons for the installation of centralized systems can be broken down into three groups:

1. Safety.
2. Proper Lubrication.
3. Cost Savings.

The theme of the lubrication engineers at Republic is "Proper lubrication in a safe manner at minimum cost." It was pointed out that with modern-day equipment it is no longer sufficient to have oilers endeavoring to hit the multiple lubrication points. It is an absolute necessity to keep the human element to a minimum, thus the need for centralized systems.

With the installation of centralized systems, either hand pumped or automatic, it becomes necessary to have highly skilled maintenance men to maintain and operate the lubrication equipment, and to have ample equipment properly located.

Mr. Holland's talk was supplemented by slides showing the actual installations on the various types of equipment at Republic Steel. He pointed out the lubrication points that would be hazardous to reach due to moving parts or treacherous perches.

A short movie exemplifying the time saving and added safety of centralized systems concluded the talk. The movie first showed the old method of lubricating the stoker mechanisms of three boilers by means of hand-turned grease cups. It took the oiler 1¾ hours to properly lubricate all points, and many of the points were in extremely hazardous positions on moving parts. With the installation of hand-operated centralized systems the oiler can properly do his job in two minutes time in a completely safe manner.

Special Announcement: At an Executive Committee Meeting held in January for the purpose of preliminary planning for the 1952 National Convention, Mr. C. R. Schmitt, E. F. Houghton & Co., and present Chairman of the Cleveland Section, was elected Cleveland Convention Chairman.

Ed. Note—As we go to press we have been notified that Mr. Schmitt is being transferred to the Philadelphia offices of E. F. Houghton & Co. It was unanimously agreed by the Cleveland group that N. I. Whitey of American Steel & Wire Co. was to act as Chairman of the Cleveland Section for the balance of Mr. Schmitt's term and also to succeed Mr. Schmitt as 1952 Cleveland Convention Committee Chairman.

PHILADELPHIA

By William Eismann, Jr., Secretary

"Pollution Abatement" by W. B. Hart, Supt. of Services, Atlantic Refining Co., Point Breeze Plant—January meeting.

Mr. Hart opened his talk with a brief history on the development of the pollution problem as a result of the increase and centralization of population. The ability of a stream to overcome pollution is dependent upon its dissolved oxygen content. Certain chemicals have a great affect on dissipating the dissolved oxygen to a serious degree.

It was pointed out that the underground waters are many times affected by pollution with a result that very expensive methods of treating boiler water must be used and, in some instances, plants have had to close down or move to a new site as a result of this type of pollution.

In Pennsylvania, the anti-pollution law restricting dumping of coal silt into sewers has proved to be an extra source of income to many of the operators as recovery and cleaning of this material has produced soluble by-products.

In many areas, the point has been reached where "we can no longer afford not to afford pollution abatement."

(*Continued on page* 90)

ACRO

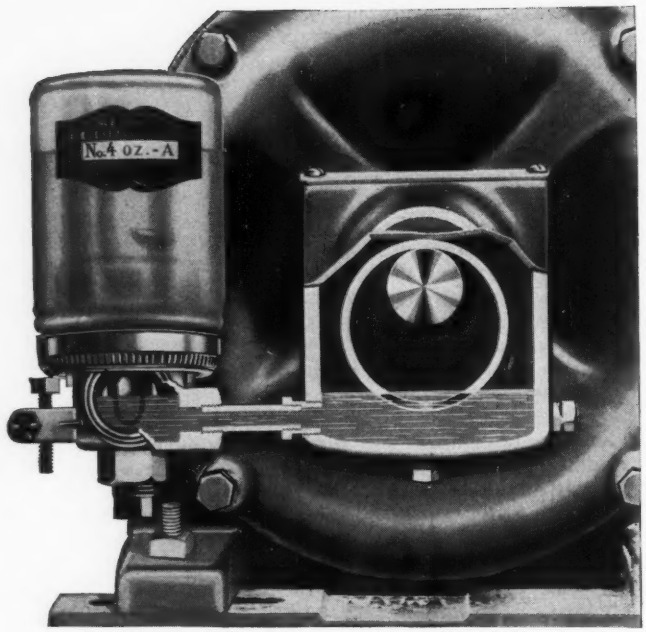
CONSTANT LEVEL LUBRICATORS

An Ideal Automatic Lubricator for:

LINESHAFTS, CONVEYORS, ELECTRIC MOTORS, BLOWERS, ETC.

Here's an efficient lubricator that will save money for you two ways. It saves in maintenance and oil costs. For instance, one filling of oil lasts six months to a full year. Hand oiling maintenance costs are cut 75 to 90%. Oil savings reach as high as 75%. Savings in oil alone are sufficient to pay for the lubricator within one year. Maintenance and repair costs are naturally converted to profits.

Prove it to yourself. Install one Acro Constant Level Lubricator and make your own comparison. Others have done this and ordered lubricators for additional machines, equipment, etc., and for new equipment as installed. Two such case histories are shown at the right. Write for free bulletin.



HIGHLY ACCEPTABLE BY INDUSTRY . . . CHECK THE ORDER HISTORY OF THESE TWO NATIONALLY KNOWN MANUFACTURERS.

CONNECTICUT Manufacturer*

Feb. 21, 1950	4-8 oz. Lub's
	2-16 oz. "
April 4, 1950	12-4 oz. "
April 19, 1950	144-4 oz. "
June 5, 1950	144-4 oz. "
July 17, 1950	144-4 oz. "

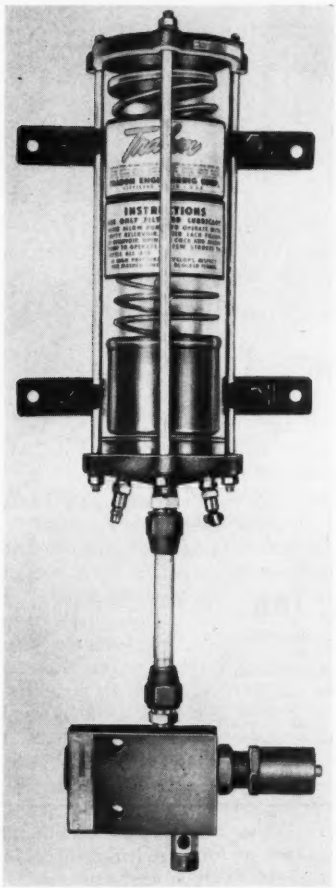
*NAME ON REQUEST

NEW JERSEY Manufacturer*

1-10-49	100-4 oz. Lub.
3-15-49	14-4 oz. "
7-18-49	45-4 oz. "
8-5-49	90-4 oz. "
8-23-49	170-4 oz. "
9-26-49	174-4 oz. "
11-23-49	27-4 oz. "
12-5-49	12-4 oz. "
3-3-50	390-4 oz. "
9-21-50	82-4 oz. "

ACRO METAL STAMPING CO.

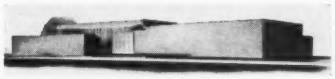
350 E. RESERVOIR AVENUE
MILWAUKEE 12, WISCONSIN



HYDRAULIC LUBRICANT PUMP: This new oil or grease pump operated from a hydraulic system is readily adaptable to machine tools, presses, mining machines, drill presses, etc. The "Hydra-Lube" Pump is connected to the supply lines of any double acting cylinder. Each stroke of cylinder cycles the pump once. The volume per stroke is adjustable from a maximum of .25 cu. in. to almost zero. Pressure is developed in a ratio 3½ times the hydraulic pressure. Volume of hydraulic fluid required to operate "Hydra-Lube" pump, approximately ½ cu. in. per stroke.

For complete details write for "Hydra-Lube" Bulletin No. 514.

Trabon Engineering Corp.
1814 E. 40th St., Cleveland 3, Ohio



NORGREN PLANT: Construction is in progress on the new modern plant of this well-known Denver manufacturer of pneumatic equipment. The new structure will provide more than twice the capacity of present facilities, providing for the continuing growth of the company.

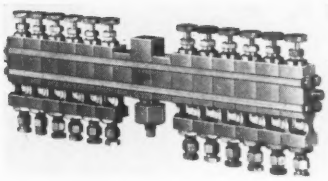
The Norgren firm is a leading manufacturer of oil fog lubricators, pressure regulators, air line filters, relief valves and other pneumatic products.

C. A. Norgren Co.
222 Santa Fe Drive, Denver 9, Colo.

HAND TRUCK: This new dual-purpose truck with a built-in hydraulic hoist for lifting and stacking is currently being introduced. It is designed to fill the need for a small, light-weight, highly maneuverable, hand truck that will enable one man to load and stack heavy drums after transporting from one location to another.

It is of compact, sturdy construction, weighing only 111 lbs., with a capacity of 500 lbs., and will lift loads to a height of 54". The platform is 22"x 19". Bulletin No. P-1 describing the truck in detail is available.

Clark-Hopkins Equipment Corp.
Philadelphia 23, Pa.



ANGLE SIGHT FEED VALVES: The manufacturer announces a newly developed line of valves for pressure or gravity oiling systems, permitting the user to construct his own oiling system at low cost. These valves have extremely free-flow characteristics and can be visually checked and used singly or gang mounted.

Single valves are equipped with needle valve control, smooth hairline adjustments and large orifices. Available in three body sizes, furnished with a variety of pipe threads.

Multiple valves permit oiling controlled from a central point, feeding from a reservoir through sight valves to a number of individual bearings. Oil fed to each bearing, can be individually adjusted and observed at one station. Constructed of light weight aluminum-alloy, the entire assembly can be taken apart for cleaning.

Prompt delivery can be made and further details furnished by writing the manufacturer.

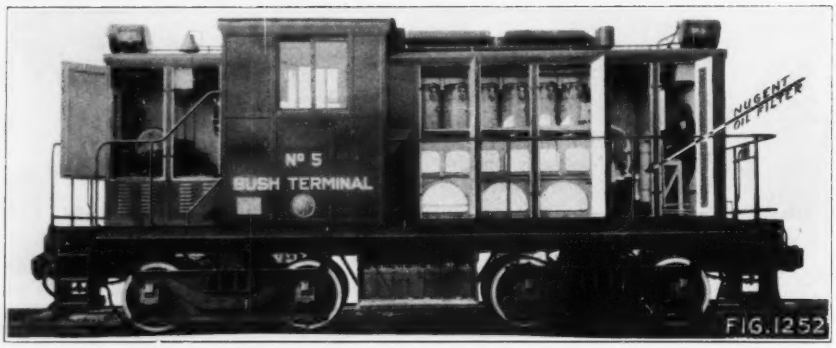
Oil-Rite Corp.,
3428 S. 13th St., Milwaukee 15, Wis.

"GRAFLUBE" BEARING: This graphite impregnated bearing is said to require no lubrication or maintenance. It is claimed to be impervious to salt or fresh water, most hydrocarbons, and has high resistance to weak acids and bases. Adaptable for continuous operations under temperatures ranging from minus 50 to 450 F. It is said to carry loads as high as 1100 psi. for protracted periods with negligible wear.

It is essentially a slow speed bearing, but may be operated at high speeds under fluid immersed conditions. Examples of highly satisfactory service of the molded graphite are: shaft bearings on mixer paddles for plastic kettles, alignment bearings on vertical pumps, fan or blower bearings, slow speed line or drive shafts, pillow blocks, conveyor hangers and others. Bulletins and specifications available on request.

Graflube Bearing Co.
1416 E. Burnett St., Long Beach, Cal.

20 Years of Protection for 7 Diesel Locomotives



with NUGENT "Full Flow Filtering" Pressure Filters

In 1930 Bush Terminal Warehouse, Brooklyn, N. Y., put into service seven Ingersoll-Rand diesel powered G.E. locomotives. All were equipped with Nugent "FULL FLOW FILTERING" Bag-Type Filters for lube oil. Now after 20 years all seven locomotives are still in service and only one has had to be overhauled (that after 18 years service). The Nugent Filters are cleaned every three or four months and the bags washed and re-used. Here is proof of the long term economy and effectiveness of Nugent Full Flow Filtering.

NUGENT TRADE MARK

Wm. W. Nugent & Co., Inc.

402 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897

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ASLE ANNUAL CONVENTION

AND

LUBRICATION SHOW

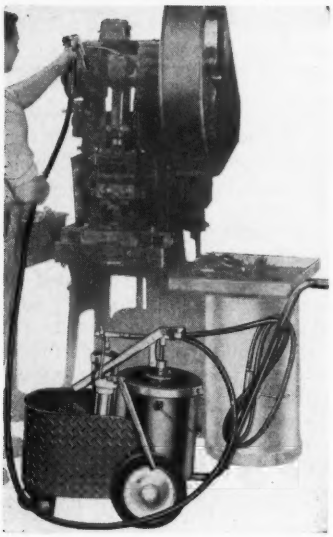
APRIL 16-17-18

HOTEL BELLEVUE-STRATFORD — 18th FLOOR
PHILADELPHIA, PA.

LATEST DEVELOPMENTS IN

LUBRICANTS — APPLICATION DEVICES — FILTRATION — CHEMICALS

Full Details on Other Pages of This Issue



GREASE RIG: Announcement is made of a lube service cart for dispensing lubricants to industrial bearings. Compact and highly maneuverable, this two-wheeled grease rig moves along plant aisles and between closely placed production machines. Since all grease and oil equipment on the rig is removable, even remotely located machines which are inaccessible to the cart can be greased without the cart's equipment.

When stocked with grease and oil for general purpose lubrication, the lube service cart is a completely self-contained unit, requiring no air supply. All equipment is hand operated. An oil pump dispenses oil either in single shots or in a steady stream. Two models are available, both featuring high pressure and volume greasing. For additional information write the manufacturer.

Gray Co., Inc.
200 Graco Square, Minneapolis 13, Minn.

WAX AS LUBRICANT: Tests conducted in a variety of metal working manufacturing plants, show that special blends of waxes used in place of conventional lubricants permit the drawing of stainless steel far beyond its theoretical capacity.

They may also serve as a replacement for the copper flashing on stainless steel wire used for cold heading. Wax blends are also proving useful in the drawing of aluminum. It is reported that metal fabricators find the use of wax as a lubricant will extend the life of tools and dies and in some cases completely eliminate degreasing. For further information write the company.

S. C. Johnson & Son, Inc.
Racine, Wisc.

UCON HYDROLUBES: This booklet presents in detail the physical properties and advantages, as well as the uses of these fire resistant hydraulic fluids. Ucon hydrolubes were developed to meet the need for hydraulic oils which could be used in locations where fire hazards exist.

Their high viscosity index, low leakage loss, and slight hazard to workmen in use are described. They are reported as having no effect on packings or seals when used in die casting machines, mechanical manipulators, scrap balers, electric welders and other equipment. Free copies available.

Carbide & Carbon Chemicals Div.
30 E. 42nd St., New York 17, N. Y.

INDUSTRIAL CATALOG: Described and illustrated in the 14 pages are hydraulic grease fittings, couplers, swivel couplers, control handle for boosting grease pressures to 12,000 lbs., and top oiler for upper cylinder lubrication. Copy free on request.

Universal Lubricating Systems, Inc.
690 Allegheny Ave., Oakmont, Pa.

STANDARD OIL BULLETIN: "Bearings and Their Lubrication" is designed primarily for the instruction of Standard's Service Representatives. However, a limited number of copies are available to mid-western industrial concerns.

This highly illustrated Engineering Bulletin contains considerable information on all types of bearings and their lubrication. It also includes sections on "Significant Properties of Lubricants and Diagnosis of Bearing Failures."

Standard Oil Co. (Indiana)
910 So. Michigan Ave., Chicago, Ill.

GRAPHITE BOOKLET: Contained in its 23 pages is data regarding the history, sources of supply, characteristics of various graphites, specific properties, recommendations for the selection of the best suited graphite for a particular requirement, and general information on the products made from or with natural graphite.

Distribution of the booklet is without charge to engineers, designers and technical men whose request is made on their company letterhead.

Joseph Dixon Crucible Co.
Wayne & Monmouth Sts.
Jersey City 3, N. J.

75th ANNIVERSARY: A 24-page brochure commemorating the company's 75th year has just been published. It combines both technical data and historical information about the company, tracing Brooks' history from its beginning as a lamp oil producer to its present position as one of the large compounders of industrial lubricants.

Case histories are cited on Brooks' lubricants on such applications as open and enclosed gears, corrosion protection, rolling mills, bearings, leaking gear cases, gear reductions and wire drawing machines. Copy of this brochure may be obtained by writing the company.

The Brooks Oil Co.
934 Ridge Ave., Pittsburgh 12, Pa.

DATA BOOK No. 1-50: This booklet contains much informative data on the subject of lubrication, and sets forth lubricant recommendations for machinery and equipment as used in practically all industries. Available on request by writing to the company.

The Lubriplate Div. of
Fiske Brothers Refining Co.
129 Lockwood St., Newark 5, N. J.

"PENSILUBE": This new product compounded of powder lubricants and molded with two waxes is applied like a pencil to parts to be lubricated. For the home, shop, office and factory for lighter applications. The silver colored "Pensilube" will not soil the hands or clothes. Full details may be had by addressing the manufacturer.

Reardon Products
2109 So. Adams St., Peoria 2, Ill.

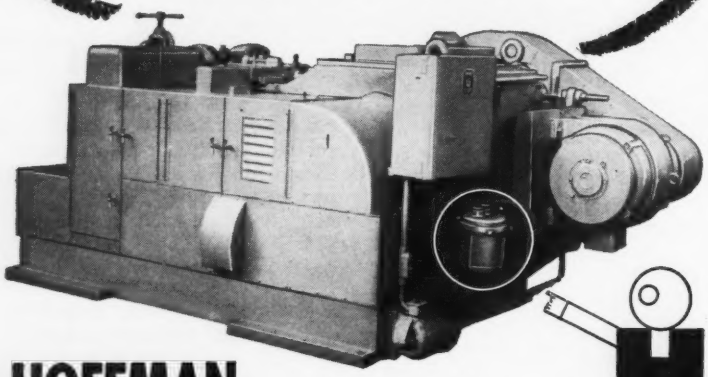
ATTENTION: Speaking of New Products, Equipment, and Literature reminds us that we are in desperate need of old literature—copies of LUBRICATION ENGINEERING, Vol. 3 - No. 1 (February-March, 1947). All copies accepted regardless of condition, providing text is intact. 50c per copy paid on receipt. Mail to National office.

ASLE

343 S. Dearborn St.,

Chicago 4, Ill.

FOR BETTER OIL CLARITY —MORE ECONOMY

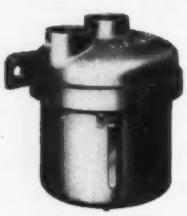


HOFFMAN DISC FILTERS NOW STANDARD on this Waterbury Farrel Hipro-Header

Despite a 10 to 1 difference in first cost, over previous filters, Hoffman Model I-6-15D Disc Filters proved more economical for Waterbury Farrel Foundry, builder of this high-speed Hipro Header.

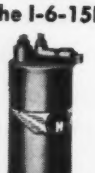
Built to head bolts, screws, rivets, etc. from stock up to ⅜" O.D., this machine has a capacity of 115 units per minute. Extensive tests revealed that operation with the Hoffman filter meant greater lube oil clarity and longer filter disc life – thus, greater operating economy for the purchaser.

Hoffman disc filters have cleanable discs. Filtration at operating pressures up to 150 psi is accomplished without moving parts. Low maintenance cost. Write for Bulletin A669 for complete details *now*.



The I-6-15D

Hoffman Disc Filters, furnished in three sizes, may be installed singly or in units, to provide continuous clarification. Compact design for installation where space is limited. The I-4-15D delivers 1 to 10 g.p.m.; the I-6-15D provides 5-50 g.p.m. and the I-6-90D, 50 to 125 g.p.m. For the correct filter size for your requirement, Hoffman filtration engineers are at your service.



The I-4-15D

The I-6-90D

FILTRATION DIVISION

U.S. HOFFMAN MACHINERY CORPORATION

217 LAMSON STREET, SYRACUSE 6, N. Y.

CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD., NEWMARKET, ONT.

NEWS OF THE SECTIONS

(*Continued from page* 85)

DAYTON

By Virgil C. Hutton, Secretary

"Grease Application Devices" by R. F. Strohecker, The Texas Co.—January meeting.

Mr. Strohecker discussed the methods used in determining pumpability and the results obtained by various methods of test. Slides were used to show the test equipment and the data collected. The informality of the meeting resulted in an unusually large number of questions and comments from the audience.

"Design, Application and Maintenance of Tapered Roller Bearings" by S. W. Weckstein, Chief Engineer Industrial Div., The Timken Roller Bearing Co.—February meeting.

Mr. Weckstein opened his talk by calling attention to the importance of proper bearing design, application and maintenance, if maximum life and performance are to be obtained. To secure this it is necessary to have the cooperation of the machine designer, equipment manufacturer and the equipment operator.

The design of tapered roller bearings was explained and the function of the cage, rollers, cup and cone described. Slides were used to show the various types of bearings and seals, and their applications.

Mr. Weckstein stressed the importance of proper lubrication of bearings, whether they are journal or anti-friction type. Various conditions under which lithium soap, barium soap, sodium soap, calcium soap and mixed soap greases as well as the silicones and oils are recommended, were given. The function of lubricants in anti-friction type bearings was given as follows:

1. Reduce friction.
2. Carry away heat.
3. Protect bearing surfaces against corrosion.
4. Aid the seals in keeping the lubricant in its place and keeping foreign matter out of the bearings.

INDIANAPOLIS

By R. C. Fatout, Secretary

"Machines and Engineers," by O. D. Lascoe, Professor of Manufacturing Processes of the General Engineering Dept., Purdue University—January meeting.

Professor Lascoe brought out the improvements in shop training

(*Continued on page* 92)

asle convention social functions

welcome luncheon

Mr. Don Rose, the guest speaker at our Welcome Luncheon to be held on Monday, April 16th, has had an extremely interesting career. Born in England, now a naturalized American citizen, he is the father of 12 young Americans, 7 boys and 5 girls. His experience in the field of journalism has been wide and varied, encompassing such activities as editorial writer, daily columnist, and teaching Journalism at Penn State College, Columbia U. and others. He is the author of seven books, his most recent "Full House" was published in March of this year. Mr. Rose has travelled widely, including a 20,000-mile tour to post-war Europe as a correspondent in July 1945. His comments on life with its many complications should be both amusing and instructive.

annual banquet

We are pleased to announce as guest speaker at our Sixth Annual Banquet, Tuesday evening, April 17th, one of the country's most active business and civic leaders, Mr. Henning W. Prentis, Jr., Chairman of the Board of Armstrong Cork Company and past president of the National Association of Manufacturers. Mr. Prentis is widely known for his continuous and broad service in the interest of public welfare. He served with distinction on President Truman's Labor Management Commission in 1945. He has received well deserved recognition of his statesmanship from many colleges and universities who have conferred on him their choicest award, the honorary degree of LL.D. We are fortunate indeed to have a man speak to us who has manifested the high ideals and thorough understanding of the problems, both national and international, that confront us today.

IN ORDER TO FACILITATE THE LUNCHEON AND BANQUET ARRANGEMENTS, MAY WE URGE THAT YOU PURCHASE YOUR LUNCHEON TICKETS AT THE TIME OF REGISTRATION MONDAY A. M. AND YOUR BANQUET TICKETS NO LATER THAN TUESDAY A. M.

Lower Tool Costs—
with
MACCO 472
The Cutting Lubricant that
reduces costs & increases profits
On this milling job Macco 472 cut tool cost because it operates cool, absorbs heat.
INCREASE TOOL LIFE — IN EVERY DEPARTMENT
One of the reasons why Macco 472 is so widely used in so many leading plants all over the U. S. A. is because — Macco 472 drastically lowers tool costs and greatly increases tool life.
Macco 472 will produce similar results in your plant — regardless of the machines you have . . . the cutting tools you use . . . or . . . the metal you process. This is no idle statement — it's a fact.
You don't have to take anyone's word for it. For positive proof — test Macco 472 in your plant and see for yourself. If you'll do the testing, we'll supply the Macco 472 — no charge. Willing?
Send for this new illustrated folder filled with facts on Macco 472.
MACCO
PRODUCTS COMPANY
525 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Honan-Crane Cuts Diesel Overhaul 50%

A report from Lindsborg, Kansas Municipal Power Station says—

"Since installation of Honan-Crane purifiers, improvement in the *condition of oil* and in *engine cleanliness* has been so marked that city engineers plan to pull pistons *only once* every two years instead of every year as has been their custom."

ONLY A HONAN-CRANE OIL PURIFIER GIVES YOU THIS KIND OF PROTECTION

Write today for complete information

HONAN-CRANE CORPORATION
818 WABASH AVENUE, LEBANON, INDIANA
A SUBSIDIARY OF
HOUDAILLE-HERSHEY CORP.

Honan-Crane purifier using Cranite (specially processed Fuller's earth) continuously serves the 1200 HP. Model 33FD Fairbanks, Morse dual fuel unit at Lindsborg, Kansas Municipal Power Station

(*Continued from page* 90)

courses in universities over the past ten years. He stressed the need for more academic subjects, and suggested that methods and machines be observed in industry in order to keep abreast of the latest developments in machine design. The newest and most improved machinery should be available for shop practice, and this can be done through the cooperation of industry and the machine builders. In the shop training program a great deal of emphasis is placed on the maintenance and lubrication of each machine, as well as the proper use of lubricants during operation.

Future plans at Purdue include production research on cutting oils and lubricants, and arrangements are underway to establish a permanent clinic in lubrication as applied in this production research. This type of program provides an excellent opportunity for industry to obtain trained men schooled in the proper use of machine tools and economical methods.

CHICAGO

By L. B. Burt, Vice Chairman

Speaker — James W. Hopkinson, President, Penn Petroleum Corp. and Chairman of the ASLE National Membership Committee — February meeting.

Mr. Hopkinson stressed the importance of a carefully planned and well organized program for industry in the procurement of new equipment and the modernizing of existing machine tools by the installation of sealed bearings wherever possible. He suggested installing, on the less modern equipment, centralized lubrication systems. He further recommended a practical approach to efficient lubrication through the proper training of personnel. Recommendations were made for the adoption of minimum quality standards for the purchase of lubricants. Mr. Hopkinson presented to his audience examples of actual savings made through a modernized machine tool program, supplemented by a carefully planned system of preventive maintenance.

"The Main-Ten-Ends in Hydraulic Maintenance" as set forth by M. A. Hayden, and published in a recent issue of the Journal was reviewed, and many details were covered in a discussion of the reasons why this program should be adopted.

Mr. Hopkinson is doing an outstanding job as Chairman of the Membership Committee and promoting the interests of ASLE before all of the many sections where he appears as guest speaker.

YOUNGSTOWN

By M. C. Jones, Secretary

"Anniversary Meeting and Bosses' Night, January 18th.

Mr. C. L. Pope, Eastman Kodak Co., and past President of ASLE, discussed the subject "What Lubrication Means to Management." He commented on the need for trained lubrication engineers to furnish information at the design, production and maintenance levels.

The Youngstown Section was organized a year ago, and our Journal paid tribute to the city by aerial cover on the December issue. Newspaper publicity covering the Anniversary Meeting was excellent.

FORT WAYNE

"Grinding Wheels, Coolants and Lubricants" by G. T. Rideout, Norton Grinding Co., Worcester, Mass. —February meeting.

Mr. Rideout is Field Test Engineer of the Worcester firm. He is the author of a number of papers on abrasives and their use.

PROVEN LUBRICANTS
FOR ALL APPLICATIONS
INDUSTRIAL · AUTOMOTIVE
TURBINES
STEAM ENGINES • DIESEL ENGINES
METAL WORKING • PLANT MACHINERY
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SINCLAIR REFINING COMPANY
630 FIFTH AVENUE NEW YORK 20, N. Y.

DETROIT

By C. H. Guider

"Lubricating Roller and Ball Bearings" by H. T. Morton, Motor Bearing Co., Ann Arbor, Mich.—February meeting.

The subject was well covered and illustrated with slides.

Mr. Guider informs us that the Detroit Section will be well represented at our Philadelphia Convention with at least fifteen members and their wives attending.

The Detroit group is taking an active part in Detroit's 250th-year birthday celebration.

PITTSBURGH

By M. C. Miller, Secretary

"Lubrication as Applied to Coal Mining" by A. Lee Barrett, Chief Research Engineer, Joy Manufacturing Co.—January meeting.

Mr. Barrett presented an interesting technicolor movie on coal mining equipment, and his subject was enthusiastically received.

The Pittsburgh Section is making rather extensive plans for the further growth and success of their group.

BUFFALO

"Lubrication Pays" by L. T. White, Cities Service Oil Co., New York City—January meeting.

The subject covered the value of the lubrication engineer to management and to industry in general. Mr. White is widely experienced, and his message was of importance not only to lubrication engineers, but to plant maintenance personnel as well.

PERSONALS

Van Gundy to Chicago: J. C. Van Gundy, Chairman of the 1951 ASLE Convention Program Committee, has been transferred to the Chicago offices of the Texas Co., Technical and Research Division. Jack was very active in the New York Section of the Society, and while we dislike using trite phrases, the only apt remark we can make is "New York's loss is Chicago's gain."

Zino Advances: Congratulations on the appointment of Mr. A. J. Zino, Jr., to Assistant to the President of the Swan-Finch Oil Corp. of New York City.

He is past Regional Vice President of the ASLE, a member of its Educational Committee, and prominent in the work of the New York Section. He is the author of numerous articles on lubrication which have appeared in technical publications, including LUBRICATION ENGINEERING, with particular emphasis on hydraulic fluids. The second of our monographs, entitled "Petroleum Type Hydraulic Fluids" was in the main, the work of Mr. Zino. He is a member of other technical societies.

J. R. Heller: We announce with regret the death of Mr. Heller, one of the founders of the Elco Lubricant Corp. of Cleveland, on February 8, 1951, at the age of 50. Mr. Heller was for many years Director, Vice President and General Manager of Elco Lubricant. He was a pioneer in the hypoid gear lubricant field.

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Syracuse	T. F. Dundon		Russell Buyea	S. B. Krutulis
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Youngstown	C. M. Winn	C. T. Lewis	M. C. Jones	H. J. Hagan

* (U.S.A.)
† (Canada)

ADDRESSES OF SECTION SECRETARIES

Baltimore—Harry A. Rau, Jr., Crown Cork & Seal Co., Inc., Eastern Ave. and Kresson St., Baltimore 3, Md.

Boston—A. S. McNeilly, 71 Lincoln St., Melrose 76, Mass.

Buffalo—Varian Steele, Industrial Bearing Corp., 1466 Main St., Buffalo 9, N. Y.

Chicago—R. W. Regan, Sun Oil Co., 310 S. Michigan Ave., Chicago 4, Ill.

Cincinnati—W. H. Cornelius, 50 McAlpin Ave., Erlanger, Ky.

Cleveland—Warren H. Bruns, Cleveland Graphite Bronze Co., 17000 St. Clair Ave., Cleveland 10, Ohio.

Connecticut—D. H. Van Vleck, Cuno Engineering Co., 80 S. Vine St., Meriden, Conn.

Dayton—V. C. Hutton, Delco Prod. Div., General Motors Corp., 329 E. First St., Dayton, Ohio.

Detroit—J. W. Swain, Jr., Mergraf Oil Products Co., Inc., P. O. Box 95, Northville, Mich.

Evansville—W. C. Kerney, Shell Oil Co., 1024 E. Mulberry, Evansville, Ind.

Fort Wayne—Dean V. Wills, 3715 Hiawatha Blvd., Fort Wayne 6, Ind.

Indianapolis—R. C. Fatout, Alvord Oil Co., 1501 S. Senate, Indianapolis 2, Ind.

Kingsport—B. H. Jorgenson, Tennessee Eastman Corp., Kingsport, Tenn.

Los Angeles—Edward A. Mohr, Shell Oil Co., Inc., 2015 Long Beach Ave., Los Angeles, Cal.

Milwaukee—R. G. Cassidy, Filmite Oil Corp., Station "K", Milwaukee 10, Wisc.

New York—D. B. Gordon, Socony-Vacuum Oil Co., Inc., 230 Park Ave., New York 17, N. Y.

Northern California—R. W. Young, Jr., Union Oil Co. of California, 425 First St., San Francisco, Cal.

Philadelphia—W. Eismann, Jr., 512 Hunters Lane, Whitemarsh Downs, Oreland, Pa.

Pittsburgh—M. C. Miller, 5133 Saltsburg Rd., Verona, Pa.

St. Louis—James B. Davis, Monsanto Chemical Co., 1700 So. Second St., St. Louis 4, Mo.

Syracuse—Russell Buyea, New Process Gear Corp., 500 Plum St., Syracuse 1, N. Y.

Twin Cities—J. R. Ritchie, Jr., Ritchie Engineering Co., 3509 Irving Ave., South, Minneapolis 8, Minn.

Youngstown—M. C. Jones, 3401 Idle Wood Ave., Youngstown, Ohio.

A.S.L.E. NATIONAL COMMITTEE CHAIRMEN

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Research and Projects:
E. M. KIPP
Aluminum Co. of America

CURRENT LITERATURE

ASTM Bulletin, No. 170, December, 1950

COMPRESSOR LUBRICATION

Hollister, K. L.—pp. 35-37

Five commercial lubricating oils, 3 naphthene oils—one alone, one inhibited against rust and oxidation, and one compounded with 3% fatty oil—a detergent heavy duty oil and a straight paraffin base oil, all having a viscosity of approximately 300 Saybolt Universal seconds at 100 F. were evaluated. Tables showing wear factors, water reaction, carbon formation indicators, low temperature characteristics, and effect of pressure on viscosity of a typical heavy compressor oil are given. The requirements of different types of compressors and the best oil for each type compressor are discussed. Paper was presented before the American Society of Lubrication Engineers on January 25, 1950, and before Section U-VI, Technical Committee B of ASTM Committee D-2 on Petroleum Products and Lubricants on February 21, 1950, at Washington, D. C.

Black Diamond, Vol. 125, No. 13, December 30, 1950

PROPER LUBRICATION CUTS MAINTENANCE COSTS

Anon. p. 62

To assist in the correct application and handling of fuels and lubricants at such operations as Leatherwood, Gulf Oil Corporation makes available to the mining industry "Gulf Periodic Consultation Service." This unique cooperative plan is designed to help customers save money.

Chemistry, Vol. 24, No. 1, September, 1950

INDUSTRIAL WASTE WATERS

Anon. p. 33

Industrial waters, which become contaminated with oil and dirt in the process in which employed, can be cleared for re-use over and over again by relatively low-cost equipment awarded a patent. This apparatus for treating polluted liquids has brought William A. Gehle, Arlington, N. J., patent #2,502,-142. It's primary use is to remove fatty materials and dirt from water to reclaim the oil as well as purify the water. On the sloping bottom of the chamber are a series of crosswise ridges and valleys to break an even flow. Gravity causes the separation. Oil is drawn off the top, and sand and solids collect at the lower end of the sloping bottom. Clear water is drawn from near the center of the exit end of the box.

FLAME RESISTANT HYDRAULIC FLUID

Anon. p. 48

Flame resistant hydraulic fluid which satisfactorily withstood tests in an underground coal-cutting machine at 1500 pounds per square inch is offered to industry by Monsanto under the designation OS-16. A clear, blue, oily liquid with a slight, sweet odor, it has a flash point at 435 F. and a viscosity index of 76, and is non-toxic. Chemically it is an ester base containing no halogenated hydrocarbons, salts or water. It is a non-conductor of electricity. Special hose, gaskets, packing material and paints must be used with OS-16, but these are already on the market.

Diesel Progress, December, 1950

LUBRICATING OIL FILTERS

Smith, H. G.—p. 68

Engines used in clean operation such as stationary installations and on highway trucks do not require the same type of filtration that is needed for dirty work like strip coal and iron mining as well as dirt dam and road building. Element design and the materials used vary quite widely from one filter manufacturer to another, but through scientific study these different manufacturers have studied the material they use and put it in an element pack in such a way that it gives the filtration they claim.

The Flying Red Horse, Vol. 16, No. 4, Autumn, 1950

SOMETHING NEW HAS BEEN ADDED

Anon. pp. 26-30

Before the use of additives reached any considerable proportions, refiners sought to improve oils through "subtractive" processes. These consisted of trying to remove undesirable qualities from lubricating oils. Refiners treated lubricating oils with sulfuric acid, or filtered the oil through clays, to remove impurities which shortened the service life of the oil. Later, processes were developed to remove unwanted components through the use of solvents. Various subtractive methods were devised to remove wax from oil. It became clear that available lubricants could not satisfy the higher speeds, pressures and temperatures of many machines. This situation led to the improvement of lubricants not only by subtractive means but also, and far more so, by the addition of chemicals. These chemicals were designed not only to enhance desirable qualities already present in the lubricant but also to impart completely new qualities not inherent in the oil. Work with turbine oil additives was made necessary when turbine lubrication demands became increasingly severe.

Industrial Laboratories, Vol. 1, No. 2, November, 1950

TESTING HIGH TEMPERATURE LUBRICANTS

Anon. p. 26

A long-range research project to evaluate lubricating oils used in industrial applications where they are subjected to high temperatures has been conducted by E. F. Houghton Company. In an 18-month study reported in the firm publication, *The Houghton Line*, conditions encountered in industrial lubricating oil uses such as in kilns, drying ovens, furnaces and heat tunnels, were duplicated in more than 150 separate tests. Oils were subjected to temperatures of 400, 450 and 500 degrees.

Institute Spokesman, Vol. 14, No. 10, January, 1951

AN OSCILLATING FRICTION MACHINE FOR TESTING LUBRICANTS

Hendricks, H. L. and Smith, J. D.—pp. 7, 9, 11-13, 15, 17, 19-20

It has been shown that the performance of a grease is not only dependent on several properties but these properties are dependent on one another to a determinative extent. Therefore, in order to obtain a true evaluation of the probable performance of a lubricant in service it is essential to run a simulated performance test of this general type. The tests on the Oscillating Friction Machine may be accelerated to some extent, as compared to average service conditions, in that the temperatures are probably somewhat above those encountered in the field, and the operation is continuous. These factors, however, are probably offset to some extent by the fact that in service the vehicle is used at irregular intervals and there is a great deal more time involved in which the lubricant can undergo changes such as oxidation even when the automobile is not in use. The article gives a drawing and a general discussion of the design of the oscillating friction machine lubricant tester.

Lubrication Engineering, Vol. 6, No. 6, December, 1950

LOAD, SPEED AND OPERATING TEMPERATURE OF ROLL NECK BEARINGS

Hitchcock, J. H.—pp. 252-255

This paper reports the results of tests which have been made to measure the load, speed, and operating temperature of the oil-lubricated sleeve-type bearings which are manufactured for application to the roll necks of rolling mills. All bearings of this manufacture are lubricated with straight mineral oil supplied by a continuous circulating system including full filtration. This paper was presented at 5th Annual Convention of American Society of Lubrication Engineers, Detroit, April 11, 1950.

MANUFACTURER OF LUBRICATING OIL; NUMBER I

Larson, C. M.—pp. 263-266

Topics considered include composition of crude oils and refined lubricating oils, lubricating oil refining, distillation of crude oils, dewaxing, chemical refining, filtration, and blending. A comparison of properties of coastal, midcontinent and Pennsylvania oils is given.

RE-REFINING OF USED MINERAL OILS BY TREATMENT WITH ACTIVATED CLAY AND HEAT

Ebrey, G. O.—pp. 267-271

This paper is limited to equipment, in which used mineral oils are subjected to a purifying treatment at temperatures varying from 275 F. to 600 F., with or without steam, while being stirred and contacted with a type of adsorbent clay. This paper was presented at Fifth Annual Convention of American Society of Lubrication Engineers, Detroit, April 11, 1950.

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AMERICAN SOCIETY OF LUBRICATION ENGINEERS TECHNICAL COMMITTEES; A NEW SERVICE ORGANIZATION WITHIN THE SOCIETY

Anon.—pp. 272-273

Technical Committees on the following aspects of lubrication were established: fundamentals, equipment, physical properties, economics, bearings, reclamation and disposal, and fluids for metal working.

SILICONE GREASE

Anon.—p. 283

A performance report is contained in a data sheet on "How to Use Dow Corning 44 Silicone Grease." It gives complete information on how to lubricate various types of bearings and suggests relubrication schedules based on laboratory testing and field experience.

National Lubricating Grease Institute, 18th Annual Meeting, Chicago, Illinois, October 30-November 1, 1950 (Preprints)

A PLEA FOR UNIFORMITY IN THE PACKAGING OF LUBRICATING GREASES

Rotter, L. C.—8 pp.

PACKAGING STANDARDIZATION

Boyd, C.—3 pp.

THE EFFECT OF SOAP COMPONENTS ON THE PHYSICAL PROPERTIES OF SODA-BASE GREASES

Musselman, J. M.—17 pp. numerous graphs and drawings

From the results obtained in this study of soda-base greases made with a Mid-Continent oil of 75 Saybolt seconds universal at 210 F., the following conclusions may be drawn: (1) Soda-base greases processed at 450 F. exhibited higher melting points than those processed at 300 F. (2) The glyceride greases exhibited more mechanical stability than greases from fatty acids. (3) The mechanical stability of greases from both fatty acids and glycerides improved with unsaturation, approaching a maximum at 75 I.V. (4) All greases from glycerides failed to pass the Norma-Hoffman Oxidation Test. (5) Greases manufactured from fatty acids, up to an I.V. of 75, satisfactorily passed the Norma-Hoffman Oxidation Stability Test. (6) The rate of change of viscosity with temperature decreased with soap content, with the viscosity of a grease of 28% soap when the temperature approached 0 F. (7) Fiber lengths of the greases increased with unsaturation, with the greases processed at 300 F. showing longer fibers than those processed at 450 F.

EVALUATION OF THE ANTI-WEAR PROPERTIES OF GEAR GREASES

Ninos, N. J.—36 pp.

From the precision and the spread of the levels of rating for the several greases tested using brass-on-stainless steel gears, it is shown that the Navy Gear Wear Tester affords a sensitive means of evaluating the anti-wear characteristics of greases for brass-on-steel applications; also this equipment appears promising for evaluating lubricants using other bimetallic combinations. The results obtained on the silicone greases indicate their poor lubricating properties for brass-steel, 24ST aluminum-steel and steel-on-steel applications: however, fairly low wear rates were obtained with the silicones when lubricating phosphor bronze-steel gear combinations.

COMPLEXES IN LUBRICATING OIL GREASES

Amott, E. and McLennan, L. W.—16 pp., 6 tables and 4 appendicies

It is believed by the authors that much less than half of the lubricating grease produced consists of oil thickened with simple normal soap. Most greases contain not normal soaps, but modifications which are hydrated soaps, basic soaps, acid soaps, or soaps stabilized with polar compounds such as salts. In this paper the authors have referred to the soap modifications, i.e., hydrated soaps, basic soaps, and soaps associated or combined with various other polar compounds, as complex. This idea is of fundamental importance in formulating many greases or in appraising their properties. It is also a consideration of importance in respect to many compounded products, such as may be used for metal cutting purposes, rust protection, or the lubrication of internal combustion engines. Finally, it is believed that the recognition of the existence of such complexes will be helpful in explaining much of the anomalous behavior that is frequently associated with greases, or other compounded products, in their formulation, in their manufacture, and in their use. A bibliography is given.

EVALUATION AND USE OF SYNTHETIC GREASES

Glass, E. M. and Rubin, B.—15 pp.

By March, 1948, all aircraft in service and all aircraft being manufactured for the United States Air Force were using AN-G-25 grease for initial and periodic lubrication. Since that time, the synthetic greases conforming to specification AN-G-25 have not only completely displaced petroleum greases of the AN-G-3a type, but also a large number of the applications where AN-G-15 greases were formerly specified. All producers with one exception have used di-(2 ethly hexyl) sebacate as the base oil for the AN-G-25 formulations and a few have used an ester-mineral oil blend. A lithium soap has been used universally as a gelling agent.

Oil and Gas Journal, Vol. 49, No. 34, December 28, 1950

INTRODUCTION TO GREASES

Anon.—p. 85

What are greases? How does grease lubricate? What factors influence grease characteristics? What are the trends in grease manufacture? What are consumer demands in greases. What do they mean? These and other questions are answered in a special series on an important group of petroleum derivatives—the modern lubricating greases—prepared by Shell Oil Co. and beginning in this issue. This article was prepared from material prepared by Shell Oil Co. on "Fundamentals of Lubricating Greases."

No. 35, January 4, 1951

WHAT IS LUBRICATING GREASE?

Anon.—p. 71

A quick definition of a lubricating grease, from the American Society for Testing Materials, is: ". . . a combination of a petroleum product, and a soap or mixture of soaps, suitable for certain lubrication applications." However, to understand what a grease really is, one must get down to the basic facts about the materials in it—the chemical characteristics of the atoms and molecules that compose these materials, together with their physical characteristics—and how all these affect its behavior.

Petroleum, Vol. 13, No. 12, December, 1950

GREASE TESTER

Anon.—p. 320

An apparatus for testing lubricants designed for use for anti-friction bearings undergoing small angle vibratory movement has been introduced. This oscillating grease tester was developed to assess the lubricating properties for use on anti-friction bearings in oscillating motion.

Petroleum Engineer, Vol. 23, No. 1, January, 1951

LUBRICATION OF REFINERY EQUIPMENT; PART I

Larson, C. M.—pp. C-5-C-12

Specifications for lubricants apply to new oil and to clean equipment in good working order. Typical oil characteristics compiled by steam turbine manufacturers are given. Lubricants used for steam engines vary with the type of engines,

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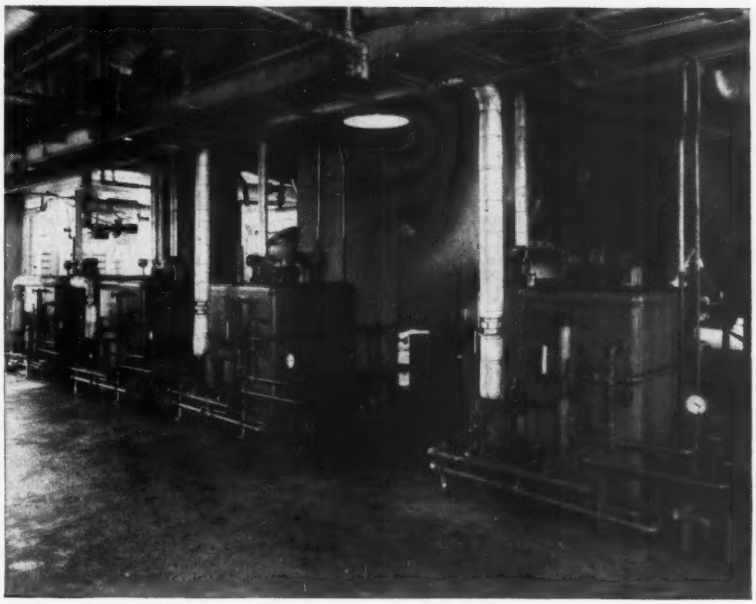

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speed, load, steam pressure, steam temperature, steam quality, and use of the exhaust steam. Gasoline engine lubricants are worn by collecting abrasive dust, some water from combustion, carbon, unburned liquid fuel, and reacting with even small quantities of anti-freeze mixture. A procedure for evaluating diesel engine lubricants is given.

Petroleum Times, Vol. 54, No. 1391, December 1, 1950

PROGRESS IN THE SCIENCE AND ART OF LUBRICATION

Paterson, E. V.—pp. 811-814

A review of recent developments in lubrication is given.

Reviews of Petroleum Technology (The Institute of Petroleum, London), Vol. 9, (Covering 1947), 1950

LUBRICANTS IN 1947

Beynon, J. H. and Hutt, E. T.—pp. 172-210

The conventional soda-or lime-base greases have been improved upon by the development of lithium-, barium-, strontium-, and aluminum-base greases. The development of continuous, as opposed to batch, grease manufacturing processes has also received considerable attention. The study of automotive lubricating-oil deterioration, means of minimizing deterioration, and the development of improved laboratory tests for engine lubricating oils continued. Advances have been made in the development of synthetic lubricants of the polymerized olefin, aliphatic diester, polyoxyalkylene, and silicone types with closely controlled properties which show advantages over the conventional petroleum-based lubricants for specific application. Improvements have been made in rolling and cutting oils, die and drill lubricants, and in the formulation of lubricants for equipment, handling corrosive acids, etc. New anti-seize and high-temperature lubricant formulations have been proposed. Problems encountered in the lubrication of steam-turbines have been discussed, and proposals made for overcoming them. Graphitic lubricants have been advanced as possessing advantages for certain applications. The successful use of water-in-oil emulsions for lubrication of railway locomotives has been described.

Scientific Lubrication, Vol. 2, No. 11, November, 1950

SELF-LUBRICATING CARBON COMPONENTS

Williams, A. E.—pp. 10-13, 26

Graphite, either alone or in combination with other materials, has long been used as a lubricant for specific purposes, and in recent years the self-lubricating property of carbon has been applied to the use of engineering components—such as carbon bearings and piston rings for compressors—contructed entirely of carbon. The difference in structure between ordinary carbon and the modern products may be seen from a glance in the microphotographs, Figs. 1 and 2, showing respectively normal amorphous carbon, and pure "Delanium" carbon. The latter depends for its strength on a single-phase structure. Table I. gives the physical properties of two of the many grades of "Delanium" materials. Other grades of carbon include "Morganite" products,

(*Continued on page* 102)

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PATENT ABSTRACTS

Printed copies of patents are available from the Patent Office at twenty-five cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents.

From Official Gazette—Vol. 642, Nos. 1, 2, 3, 4. 5.

Prepared by ANN BURCHICK

Quenching Oil Compositions—Patent #2,536,403—Joseph C. Wallace and George W. Flint, assignors to Standard Oil Co.

A quenching oil composition consisting essentially of a major proportion of an oil of the group consisting of an animal oil, a vegetable oil and a viscous hydrocarbon oil having a minimum flash point of about 300 F., from about 0.1% to about 10% of a preferentially oil-soluble alkali metal petroleum sulfonate, and from about 0.5% to about 5% of an alkali metal neutralized sulfur and phosphorus-containing reaction product of a phosphorus sulfide and an olefin hydrocarbon having a molecular weight of from about 150 to about 50,000.

Sulfurized Product and Preparation Thereof —Patent #2,536,684—Denham Harman and Wm. E. Vaughan, Assignors to Shell Development Co.

The process which consists essentially of heating a polymer having recurring units of the general configuration

—(O—R)—

wherein R is an alkylene hydrocarbon radical, with an agent selected from the group consisting of sulfur, compounds containing sulfur to chlorine linkages and compounds containing sulfur to phosphorus linkages for a period of 3 to 5 hours at a temperature between 50 C. and 200 C., the amount of said agent being sufficient to impart a sulfur content of 1 to 30% by weight of said polymer to the reaction product.

A lubricating composition comprising a major proportion of an alkylene glycol polymer and a minor amount, sufficient to impart extreme pressure properties to said composition, of a polymeric alkylene glycol reaction product with sulfur, said reaction product being prepared by the process of claim 1.

Synthetic Lubricant—Patent #2,536,685—Denham Harman and Wm. E. Vaughan, assignors to Shell Development Co.

As an extreme pressure agent suitable for imparting extreme pressure properties to oxygen-containing lubricating oils, the reaction product of a propylene oxide polymer with a phosphorus halide, said product having both phosphorus and halogen substitutes, the composition having a phosphorus content of 1-20% and a chlorine content of at least 1%, said reaction product being obtained by heating a propylene oxide polymer and a phosphorus halide at a temperature between 50 C. and 200 C.

Oil-In-Water Type Emulsion for Flameproofing Fabrics—Patent #2,536,978—Frederick Fordemwalt, assignor to American Cyanamid Co.

A stable, heterogeneous, oil-in-water type emulsion, adapted for the simultaneous deposition on fabrics from an aqueous medium of fire-resisting, coloring and binding materials, which emulsion is comprised of a continuous dispersion medium comprising water containing a hydrophilic colloid; a dispersed phase comprising a film-forming, substantially colorless fire-resistant, water-insoluble, non-volatile, chlorinated organic compound capable of liberating HC1 at elevated temperatures, a colorless, fire-retarding pigment and a hydrocarbon solvent; a separately dispersed phase comprising water-insoluble organic solvent, at least one coloring pigment and an uncured, heat-convertible, binder resin, selected from the group consisting of (a) the drying-oil-modified alkyd resins, (b) the organic hydrocarbon solvent-soluble, amide-aldehyde resins and (c) mixtures thereof; and a water-soluble soap of a higher fatty acid, the proportions as weight percentages of the total emulsion being 0.1-10% hydrophilic colloid, sufficient chlorinated organic compound to provide from about 2-12% of combined chlorine capable of liberating HC1 at elevated temperatures, 5-30% fire-retarding pigment, 0.5-10% binder resin and 0.25-4.0% soap.

Manufacture of Lubricating Oil—Patent #2,538,066—Thomas J. Walsh, Godfrey L. Ladd, and Donald W. Heil, assignors to The Standard Oil Co.

A method of producing lubricating oil blending stocks from a lubricating distillate fraction including both the light or pale oils which are relatively non-viscous and the heavier or viscous machinery oils, which comprises dewaxing the oil in the presence of a recycled acid-treated gas oil, and then acid refining said lubricating distillate fraction in the presence of about 5 to 35% of said acid-treated gas oil, and then subjecting the dewaxed and acid-refined stock to distillation under a reduced pressure as a final step to separate it into a plurality of dewaxed and acid-refined lubricating oil blending stocks, and acid-treated gas oil, and recycling said acid-treated gas oil to said dewaxing step.

Treatment of Lubricating Oils—Patent #2,538,321—Martin E. Nash, assignor to Phillips Petroleum Co.

A process of manufacturing a lubricating oil of improved properties which comprises thoroughly agitating a lubricating oil with a mixture of anhydrous hydrofluoric acid and sulfur dioxide, containing about 25 to 75 weight per cent sulfur dioxide, in the ratio of oil to treating mixture of about 1:5 to about 5:1, at sufficient pressure to maintain the hydrofluoric acid and sulfur dioxide substantially liquid, and at a temperature between about −20 C. and about 50 C., and for about 30 to about 300 minutes.

Lubricant Composition—Patent #2,538,696 —Robert L. May, assignor to Sinclair Refining Co.

A mineral oil composition consisting essentially of a major portion of a petroleum lubricating oil fraction, a minor proportion, effective to retard oxidation of the oil but not less than about 0.5%, of an inhibitor resulting from the reaction of an alkylated phenol with the condensation product of turpentine and phosphorus pentasulfide and a minor proportion effective to at least neutralize excess phosphorus acidity of a detergent of the class consisting of calcium and barium petroleum sulfonates.

Lubricating Oil — Patent #2,539,422 — Charles Hoffman, Thomas R. Schweitzer, and Mohammad Haider Anwar and Gaston Dalby, assignors to Ward Baking Co.

An emulsion resistant crankcase oil consisting of crankcase oil and from 0.05% to about 1% of the compound having the following formula:

wherein R is a cyclohexyl radical, R′ and R″ are alkyl groups containing not more than 3 carbon atoms and Y is a normal primary aliphatic hydrocarbon radical having from 8 to 20 carbon atoms to inhibit formation of emulsion.

Esters of P_2S_5-Amine Reaction Products as Lubricating Oil Additives and Lubricants Containing Same—Patent #2,539,424—Everett C. Hughes and John D. Bartleson, assignors to The Standard Oil Co.

A lubricant comprising a mineral lubricating oil and an amount of a reaction product within the range of 0.05 and 10.0 weight per cent to improve said oil in use, said reaction product being prepared by reacting one mole of an organic aliphatic amine having at least one amine hydrogen and an aliphatic radical of at least 12 carbon atoms with an amount within the range of 0.5 to 2.5 moles of a phosphorus sulfide at a temperature in the range of 400 F. to about 600 F. and esterifying the resulting product with an amount of a compound selected from the group consisting of aliphatic alcohols and phenols within the range of 0.2 to 6.0 moles of said compound per mole of product at a temperature in the range of 100 F. to 400 F. to produce an oil dispersible ester derivative suitable for addition to a mineral lubricating oil to inhibit deterioration thereof under service conditions.

Lubricating Compositions—Patent #2,-539,503—William A. Zisman and Charles M. Murphy, Jr. and John K. Wolfe.

A fluid ester lubricating composition, comprising, as the base lubricant, a branched chain, lower alkyl di-ester of sebacic acid blended with rust and oxidation inhibiting proportions, respectively, of a polyvalent metal soap of a saturated fatty acid substituted by an organic radical selected from the group consisting of aryl and alkylaryl radicals as a rust inhibitor and a phenolic compound substituted by an organic radical selected from the group consisting of aryl, alkyl, alkylaryl and amino radicals as an oxidation inhibitor.

Lubricating Composition—Patent #2,539, 504—William A. Zisman and Charles M. Murphy, Jr. and John K. Wolfe.

A fluid ester lubricating composition, consisting essentially of, as the base lubricant, di (1-theyl propyl) azelate blended with rust and oxidation inhibiting proportions, respectively, of a polyvalent metal soap of a substituted fatty acid as a rust inhibitor and a substituted phenolic compound as an oxidation inhibitor.

Solvent Fractionation of Refined Glyceride Oils—Patent #2,539,661—Stephen E. Freeman and Stewart W. Gloyer, assignors to Pittsburgh Plate Glass Co.

In a process of treating a natural glyceride oil to separate therefrom a portion which is substantially enriched in one or more components of the natural oil, the steps which comprise removing the gum from the natural oil, then extracting out said portion by countercurrently flowing furfural through the oil, the resultant system of oil and furfural being maintained at a temperature below that of compelte miscibility of the two.

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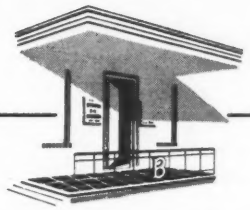

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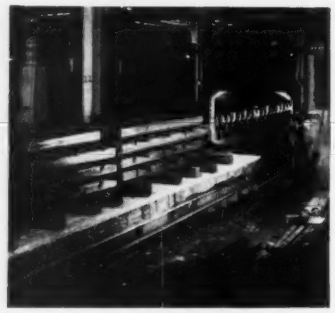
The use of PLASTILUBE in these high temperature operations has eliminated the necessity of constant regreasing and has notably reduced operating costs. The illustration shows a typical installation in a middle-western plant.



Acceptance of PLASTILUBE by so large a percentage of steel plants is further proof of the stability and versatility of this remarkable lubricant, already used daily in thousands of other industrial applications.

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For further information, samples, etc., write The Warren Refining & Chemical Co., Dept. LE-2, Cleveland 15, Ohio. *(Advt).*

SEE US AT BOOTH 44

CURRENT LITERATURE

(Continued from page 98)

which are also used in this sphere of industry. Table 2. shows the physical properties of "Morganite" grades used for the manufacture of piston rings in compressors.

AIRCRAFT LUBRICATION; PART 2—GAS TURBINE ENGINES

Hunt, K. C.—pp. 15, 16, 19

The last few years have seen the gas turbine applied in various forms as an aircraft power plant, and it is fair to say that its introduction has resulted in a revolution in aircraft engine lubrication requirements.

RECLAIMING CUTTING OILS; PREVENTION OF DERMATITIS

Harman, H. M.—pp. 23-24, 26

A typical scheme for separating water and detritus from straight cutting oils is shown in Fig. 2. The dirty oil is pumped or drained into one of the settling tanks where it is allowed to stand for some hours. The period of standing will give the heavy matter a chance to settle to the bottom from where it can be removed by means of a drain cock. The remaining oil is then heated to about 180 F. to effect sterilization and to assist separation. From this tank, the oil is allowed to flow by gravity through a separator of the centrifugal type.

Vol. 3, No. 1, January, 1951

CAN YOU WRITE ABOUT PRACTICAL LUBRICATION?

Anon.—p. 9

The American Society of Lubrication Engineers have published a list of eight Universities where courses in Lubrication Engineering are available for graduate chemical or mechanical engineers. With the object of encouraging young men interested in the theory and practice of lubrication, whether they be users or makers of lubricating products, awards to the best papers sent in from individuals of under thirty years of age will be made.

A NOTE ON THE LOW PRESSURE REGIONS OCCURRING IN THE HYDRODYNAMIC LUBRICATING FILMS OF JOURNAL BEARINGS

Cole, J. A.—pp. 10-13

This note examines the present state of knowledge concerning the sub-atmosphere pressures which can arise in portions of the lubricating films of journal bearings and which are also predicted in the mathematical analyses of hydrodynamic lubrication.

LUBRICATION OF TEXTILE MILLS

Vineall, G. J. C.—p. 16

The author objects to several statements appearing in the December issue of this magazine under the above title, especially problems arising from staining due to the lubricant.

STATIONARY OIL ENGINE LUBRICATION PROBLEMS

Anon.—pp. 22-23

The diesel engine presents such problems as oil oxidation and deposits to the lubrication engineer. Detergent oils need high operating temperatures; oil change and reclaiming methods are considered. The article is a shortened extract from a paper by E. B. Rawlins presented to the recent Petroleum Mechanical Engineering Conference, arranged by the American Society of Mechanical Engineers.

DIESEL ENGINE USERS ASSOCIATION REPORT ON WORKING COSTS

Anon.—pp. 23, 32

The Diesel Engine Users Association recently presented their Report on Heavy-Oil Engine Working Costs, at their Annual General Meeting. Sixty-eight industrial undertakings, including nine overseas, have accurately recorded all maintenance costs and details, and these are all charted under numerous headings.

FIRST PRINCIPLES; No. 18, TYPES OF GREASE

Anon.—pp. 25-26

Lime-base, soda-base, barium-base, lithium-base, and aluminum-base greases are considered. Grease fillers, additives and special grades of greases are mentioned.

Service Factor, Vol. 15, Second Edition, 1950

LUBRICATING OIL RECOMMENDATIONS FOR SLOW AND MEDIUM SPEED DIESEL ENGINES

Anon.—pp. 1-5

Generally, for slow and many medium speed engines a well refined straight mineral oil is satisfactory, although for some combinations of operating conditions, a Heavy Duty Type oil is needed for best performance. A chart of recommended or preferred Sinclair diesel lubricating oils is given. This tabulation reflects the thinking of the engine builders with respect to types of oil considered best suited for the respective engines, but is expressed in terms of Sinclair brand names. Sinclair diesel oils, Rubilene, Gascon oil and Rubilene oil HD and Gascon oil HD are taken up.

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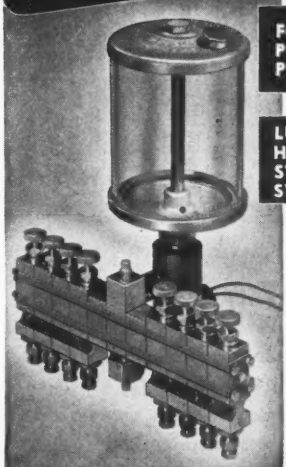

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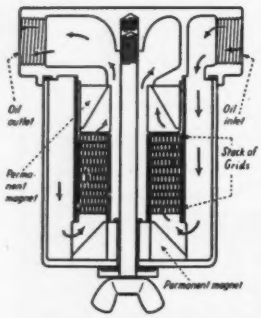

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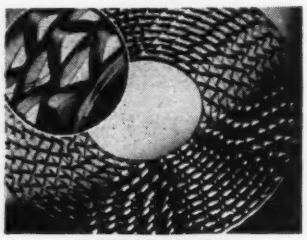

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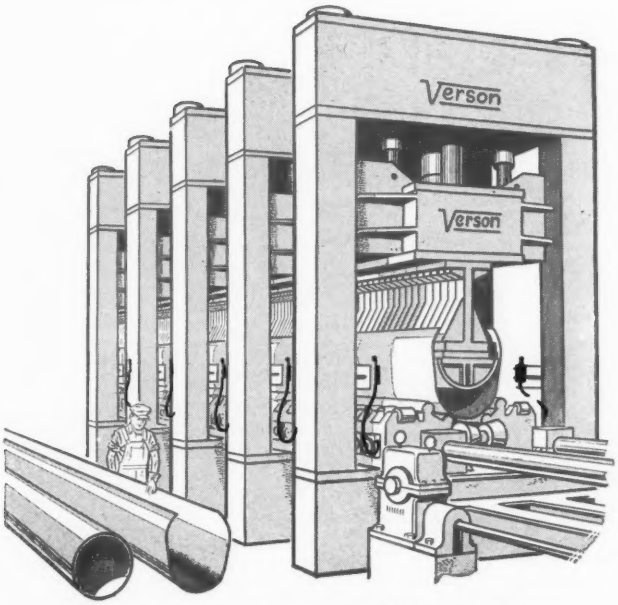
Acheson Colloids Corp.	56
Acro Metal Stamping Co.	86
Alemite	76-77
American Cyanamid Co.	51
Bowser, Inc.	97
Brooks Oil Co., The	101
Burns Laboratories, Inc.	101
Cincinnati Milling Machine Co.	79
Classified Ads	67-71-102
Farval Corp., The	Inside Back Cover
Frantz, S. G., Co.	104
Gits Bros. Mfg. Co.	103
Grafo Colloids Corp.	103
Hodson Corp., The	Back Cover
Honan-Crane Corp.	92
Houghton, E. F. & Co.	54
Lincoln Engineering Co.	50
Lubriplate Division, Fiske Bros. Refining Co.	84
Macco Products Co.	91
Madison-Kipp Corp.	55
Manzel, Inc.	98
Morgan Construction Co.	52
Norgren, C. A., Co.	96
Nugent, Wm. W. & Co., Inc.	88
Oil-Rite Corp.	103
Penola Oil Co., Associate of Esso S. O. Co.	99
Shell Oil Co.	80
Sinclair Refining Co.	93
Stuart, D. A., Oil Co., Ltd.	49
Sun Oil Co.	53
Tide Water Assoc. Oil Co.	83
Trabon Engineering Corp.	Inside Front Cover
Trico Fuse Mfg. Co.	101
U. S. Hoffman Machinery Corp.	90

Farval lubricates press for "Big Inch" line pipe

FARVAL—*Studies in Centralized Lubrication* No. 119



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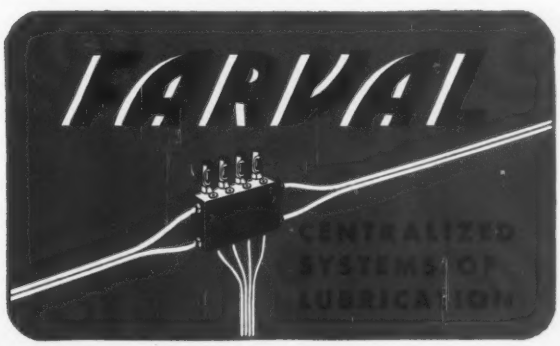

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